MODEL Airplane NEWS

AUGUST 1942
20c

BOMBING SQUADRON 3

HE PLANE THAT BOMBED JAPAN!

(Plans and story on pages 24-25)

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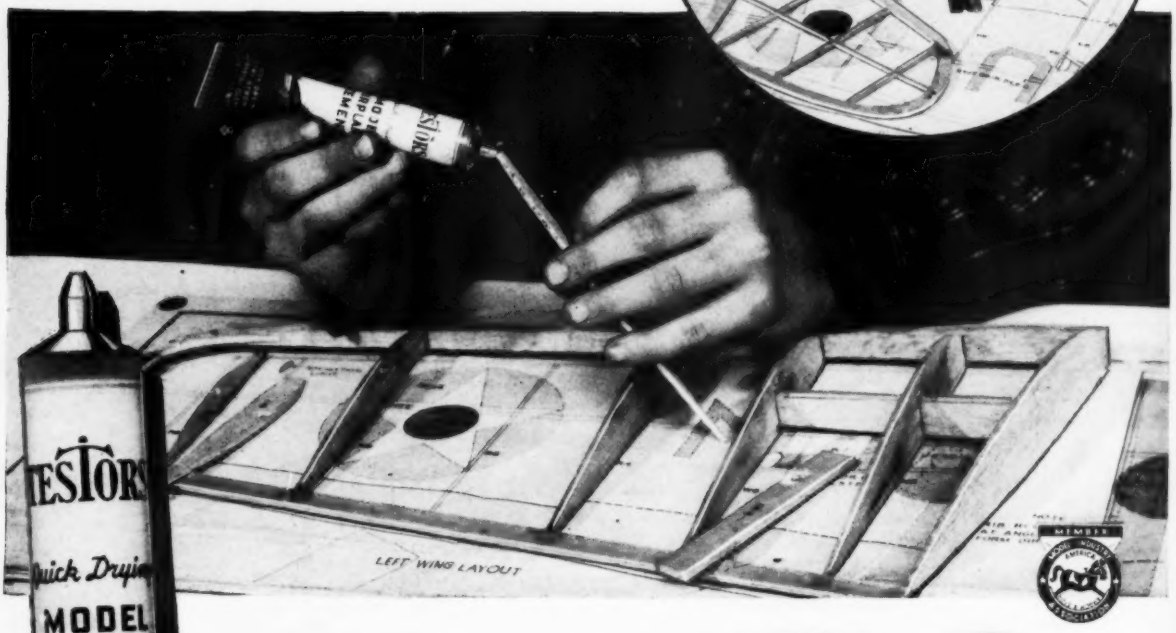

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BIGGEST news is the opening of the aerial "second front" by the Royal Air Force with raid after raid of more than one thousand bombers swooping into German-held territory. Cologne, Essen and several undisclosed smaller cities have been razed by the might of the raiders and untold millions of dollars of damage has been done. Interesting figures on the raids: On a basis of $300,000 each for the giant Short Sterling and Handley-Page Halifax bombers (American Flying Fortresses cost as much as $550,000) the cost of the bombers alone was $600,000,000; on a basis of $1 per pound for bombs (a long standing figure), a total of $12,000,000 was expended for explosives; on a basis of 50c per gallon (present cost for high-octane aviation fuel), the gasoline cost $1,000,000. This makes a total of $613,000,000 for the equipment used and one wonders if there is any area of 1 1/2 square miles (the announced area of damage in Cologne) in the world with a property evaluation of even a small percentage of this huge figure. However, the raid was worth much more than any financial amount in morale on the home front and the breaking of German confidence in their leaders. It is interesting to note that the horsepower of the engines used on the raid developed a total of 16,000,000 horsepower. The total horsepower generated by ALL the waterpower installations in the entire United States is 18,500,000! Certainly it is to be hoped that these are but the first of almost continuous sweeps over the lowlands all preludes to the destruction of Berlin.

A broadcast from Radio Berlin reveals the existence of a new type German warplane which is unconventional to say the least. The plane, known as the Blohm & Voss Bv-141, was described as being designed with "the engine and controls on the left wing and a closed cockpit for a crew of three on the right wing." The plane is designed for "special use," the broadcast continued, "and has already achieved great successes on the Russian front!" From a technical standpoint it is entirely possible that such a design might work satisfactorily and extensive discussions on the subject were carried on in the Fall of last year in the British aviation journals. However, the efficiency of such a design, which would require the setting of the control surfaces against the slipstream and the positioning of the engine off-center, is widely open to question. We shall await, with interest, more news of this plane.

Some of our readers may recall photographs and some data we published nearly two years ago on the Stearman X-100, a fearful-looking twin-engine attack plane known in the Army as the XA-21 design. The plane, after considerable modification, has recently reappeared as the Boeing AT-15 combat crew trainer.

The plane is now fabricated from steel tubing, fabric covering and plywood wing surfaces and is now powered by smaller P&W engines. It will be used for the integrated training of pilots, co-pilots, bombardiers, navigators and gun crews at advanced training bases and is a type that has been sorely needed to fill a gap in the training schedule of combat crew members. The face-lifting has not concealed its identity either. Perhaps many of you can also see through the re-vamping job done on the old Curtiss XF13C-1 Navy fighting plane which recently emerged as the 0-52 observation machine now being used widely by the Army Air Forces. Discerning readers will be able to find many other designs now greatly modified but the same basic structural outlines!

Recent figures indicate that more than FIVE THOUSAND planes of the Curtiss "Hawk" series have already been built and sent into action throughout the world. This includes the British "Tommyhawk" and "Kittyhawk" versions and the numerous models and editions of the basic P-40 design which has now progressed through the P-40J type. Other Curtiss planes shortly to be announced are the XF14C-1, a Navy fighter, the P-60, an Army pursuit plane and a new Army cargo plane fabricated entirely of wood. News is still secret regarding the Curtiss flying wing but it is known to vary from the famous Northrop design in that the former has large vertical surfaces at the extremities of the wing for directional control.

Martin's giant "Mars" flying boat, largest flying boat ever built, will shortly make its first test flight after considerable repair work necessitated by the fateful accident which damaged it just prior to its first scheduled flight four months ago. The accident resulted from a sheared propeller blade which crashed through the hull, the motor was torn loose and the engine caught fire and dropped into the river leaving the wing fuel tanks ablaze. However, the giant XPB2M-1, as it is known in the Navy, will shortly take to the air and join the Navy's fleet of giant bombers.

Pacific Coast aircraft factories are now dotted with barrage ballons as are oil reservoirs, ship-building firms and other essential areas. Camouflage has been applied to the major aircraft factories of the Southland and the huge Douglas plant can no longer be identified from the air, its roof bearing paint which gives the appearance of a peaceful residential district. But from within are pouring twin-engine light combers, four-motored cargo planes and twin-engine paratroop carriers!

Latest Italian fighter is the Macchi C202 single-seat pursuit plane which closely resembles the British Spitfire in outline. It has a wing span of 35 feet and is 20 feet 5 inches long. It is powered by a German

(Continued on page 60)

14TH YEAR OF PUBLICATION

MODEL Airplane NEWS

AUGUST, 1942 VOL. XXVII, No. 2

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Edited by
Charles Hampson Grant

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The wealth of the world's greatest industrial civilization is ready to fulfill President Roosevelt's far-sighted demand for 185,000 war planes, but it is only a vast heap of material until skilled craftsmen can mould it into long-range bombers and swift pursuit ships. While the aircraft industry has been forced to accept thousands of single-phase workers from cheap "quickie" courses, the vital supervisory positions can only be filled by men with the thorough, long-range training to reach any objective to which they may be assigned. They are the only men of this huge production army who are INDISPENSABLE to America's war effort, and who will continue to be indispensable when the aircraft industry steps down from war to peace schedules.

The executives who have made aviation THEIR career know that there is no substitute for thorough, experienced training, and they know that Curtiss-Wright Technical Institute graduates are—and for many years have been—thoroughly qualified to fill the industry's exacting requirements.

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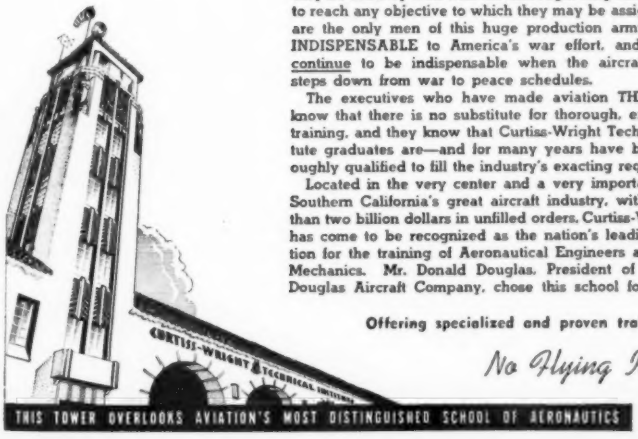

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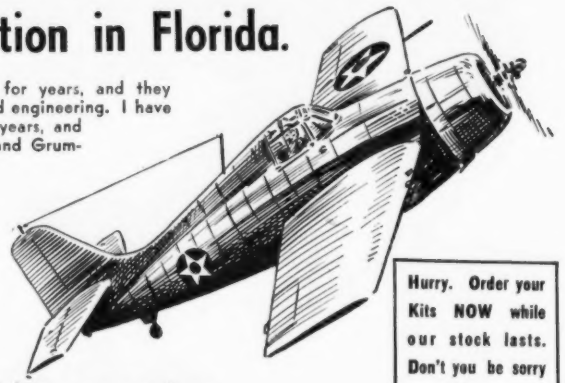
"While instructing Naval Aviation Cadets, I found my work with models invaluable in demonstrating . . . . the solutions to problems of real flight,"

writes Ensign J. F. G. of a Naval Air Station in Florida.

Continuing, he says: "I have been building Cleveland Models for years, and they have no equal for quality, completeness, and engineering. I have been instructing at Pensacola and Jacksonville for the last two years, and am now hunting subs on the Atlantic. Am working on a Cleveland Grumman Skyrocket between hops."

AN AVIATION MILESTONE • C-D • DESIGN



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Another Brand New C-D War Model!

REPUBLIC P-47 "*Thunderbolt*"

While information on this brand new Army design is still very secret, it is reputed that its speed is something over 425 m.p.h. It is an all metal fighter designed for high altitude combat and is counted upon as being one of the standard US pursuit planes. It is a veritable "flying battleship," and weighs more than a battleship in proportion to its size with its gross weight of 13,500 pounds. It is powered by a thunderous 2000 HP Double Row Pratt-Whitney engine. This should be a "must" model in absolutely every modelbuilder's collection, for it has "everything plus" including a well detailed four bladed propeller, not too difficult to make. Our C-D "Master" model of this flying battleship has a span of 30¾". Kit SF-81 **$4.00**

HAWKER "HURRICANE"

England's Great Night Fighter

This 30" miniature of the plane England owes so much to for driving off the Nazi night forays IS really a beauty. Camouflaged and colorfully decorated with the most modern authentic markings. Retractable landing gear. Master Kit SF-78..... **$3.00**

Still another New C-D War Model!

GRUMMAN F4F "*Wildcat*"

This excellent US Navy shipboard fighter, that fought like a Wildcat to hold Wake Island, is also used by the US Marine Corps and in good quantity by the English who call it the Martlet (E-36-A). This Cyclone powered mid-wing job is used extensively by the English in North Africa who have used it with considerable success. It may also be fitted for light bombing work. As a fighter, it does 325 m.p.h. This speed and its maneuverability has gained for it an excellent reputation of being "Wildcat" in fighting over the far stretches of the South Pacific with our own forces. Single handed Lt. Commdr. O'Hare flew a Wildcat in downing five Jap Bombers (worth half a million dollars) including thirty trained airmen and damaged the sixth which his squadron commander finished off including six more Japs. It has done an excellent job in many other Pacific positions against the Japs. Our C-D "Master" model of this ship has a span of 28½". Kit SF-83..... **$3.00**

CURTISS P-40 "TOMAHAWK"

Reputed to equal or better the performance of the famous British Spitfire. Model embodies latest refinements. Long projecting nose makes it an excellent scale flying model. A 28½" span beauty! Instructions for camouflaging also given. Complete Master Kit SF-77 ..... **$3.00**

Read these Excerpts from Letters from Men in the Air Forces

"At the present I am being trained to be a pilot in the R.A.F., and my modeling career has helped me considerably. It is necessary for me to know Aircraft Construction (in which I have been helped considerably by your methods of construction) and Aircraft recognition (learnt almost entirely by the authenticity of your scale models). As I am English, and only in Canada to complete my training, I intend to take a few of your Kits home to my friends in England."

A. W. G., Sask., Can.

The Deadly AIRACOBRA

Thousands of these are now in action for the United Nations against the enemy—and giving a most amazing account of themselves. Deadly as the cobra, when they sting, they kill. It is a beautiful model and due to its long projecting nose, makes a "perfect" flying scale model with a high speed performance that will please the most serious, as well as the beginning model builder. Span 25½". Complete Master Kit SF-76..... **$3.00**

German ME-109 Messerschmitt

Sleek 24¼" model of the Nazi's mass production fighter. Capable of good fast flights. Master Kit SF-74..... **$3.00**

BOEING P-26 PURSUIT

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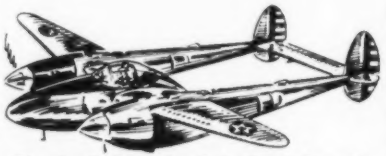
CURTISS GOSHAWK F11C-2 23⅝". Master Kit SF-49..... **$3.00**

SEVERSKY P-35 Fighter. Span 24". Master Kit SF-61..... **$2.50**



Cleveland's Superdetailed, "Supercharged"

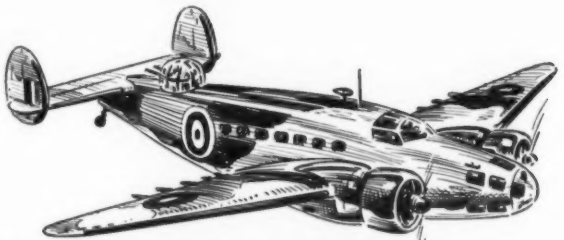
LOCKHEED P-38 "LIGHTNING"

Beautiful ¾" scale master miniature of "the world's fastest fighter"—the one that's by and gone before you even hear it. And C-D engineers have gone the limit in making this model as "terrific" as the prototype. Loads of detail! Big 38¾" span. Superpowered twin-motor job that's speedy, realistic and an absolute "must" among model builders who want the newest and best. Master Kit SF-85..... **$4.00**

"Model Airplane building not only has helped me in flying, but is also responsible for my future career in aviation. I started building models when 12 years old, became air-minded, and joined the Army Air Corps as soon as I was eligible. I am now building a Cleveland Curtiss Goshawk SF-49 in super detail."
T. O. D., Air Corps Basic Flying School, S. C.

GRUMMAN SKYROCKET

Big 31½" scale job of America's new twin motor 450 m.p.h. "Terror of the Skies." Fast flyer with both motors pulling. Master Kit SF-75..... **$3.50**



LOCKHEED "HUDSON" BOMBER

Now widely used by the British Coastal Command, and by crack American and Allied pilots over the Pacific and in the Australian patrol. Beautiful 49⅜" model correctly and minutely detailed, with retractable landing gear and "full dress" of camouflage. Flies fast and furiously with its "full load of eggs"—a perfect miniature of the prototype. Master Kit SF-95..... **$7.50**

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CURTISS HAWK. 23⅝". P6-E. Master Kit SF-21..... **$3.00**

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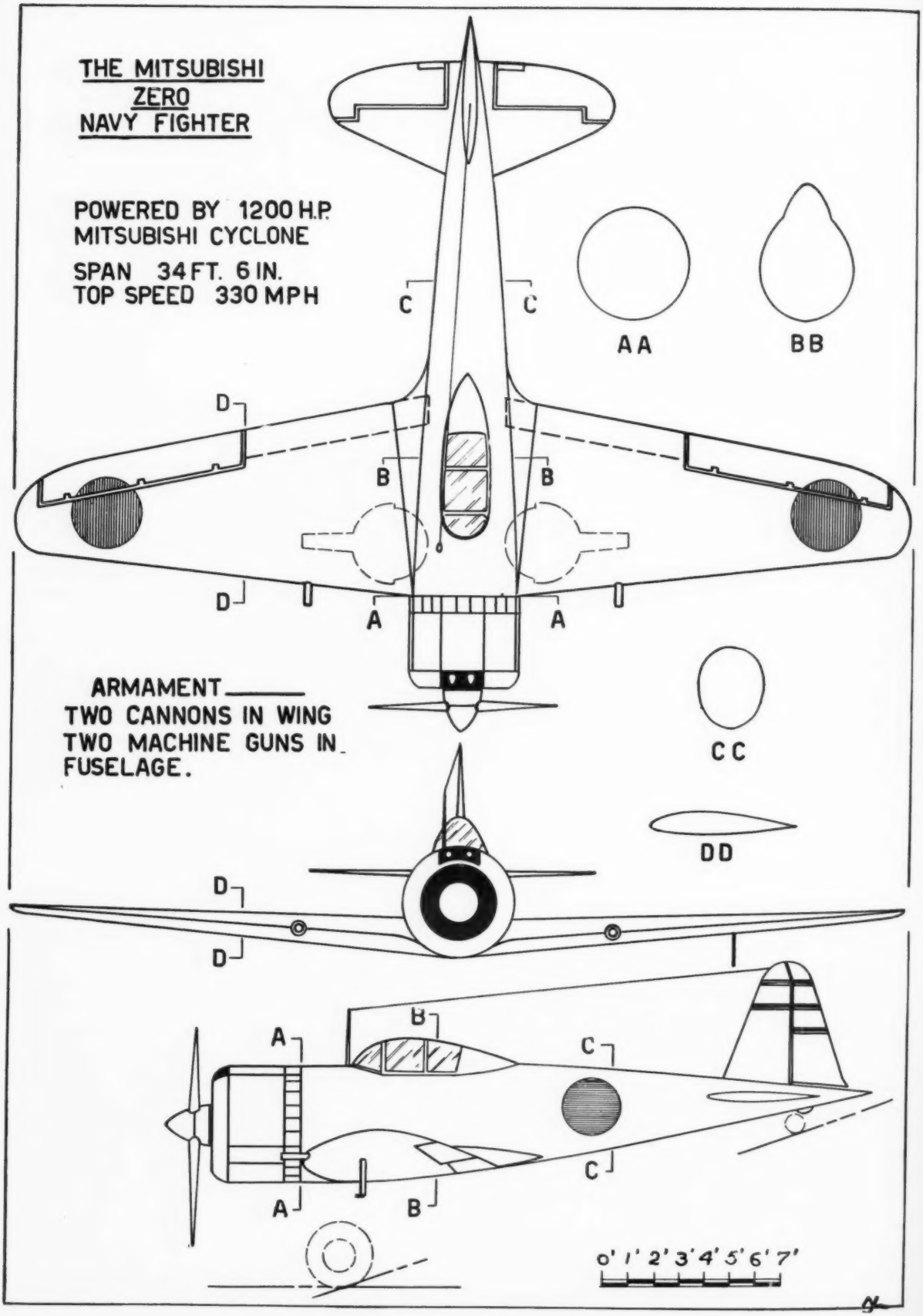
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ZERO
NAVY FIGHTER
POWERED BY 1200 H.P.
MITSUBISHI CYCLONE
SPAN 34 FT. 6 IN.
TOP SPEED 330 MPH
C
C
AA
BB
D
B
B
D
A
A
ARMAMENT
TWO CANNONS IN WING
TWO MACHINE GUNS IN
FUSELAGE.
CC
DD
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B
A
C
C
A
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0' 1' 2' 3' 4' 5' 6' 7'

THE RISING TIDE

How young America is being prepared to meet the challenge of the air age

by **ROBERT H. HINCKLEY**
Assistant Secretary of Commerce for Air

Step by step construction of a British Spitfire scale model for the Navy program, one of thousands being built by young men throughout the country. (Right) A young American starts his aviation career. (Below) First mass delivery of Navy scale model planes built by Los Angeles school boys.

TODAY—and tomorrow—we must fly or die.

These sound like wild words. They may even sound ridiculous to people who have ignored aviation but the average American who reads the daily papers will soon admit they are true. These words are directly affecting our daily lives.

When school opens again next Fall, aviation is going to be a vastly bigger word than it has ever been before. It is going to sound throughout the average home more often than ever before. It is going to figure in parents' conversations almost as much as in the torrents of eager words coming out of the mouths of our new "air-conditioned" generation.

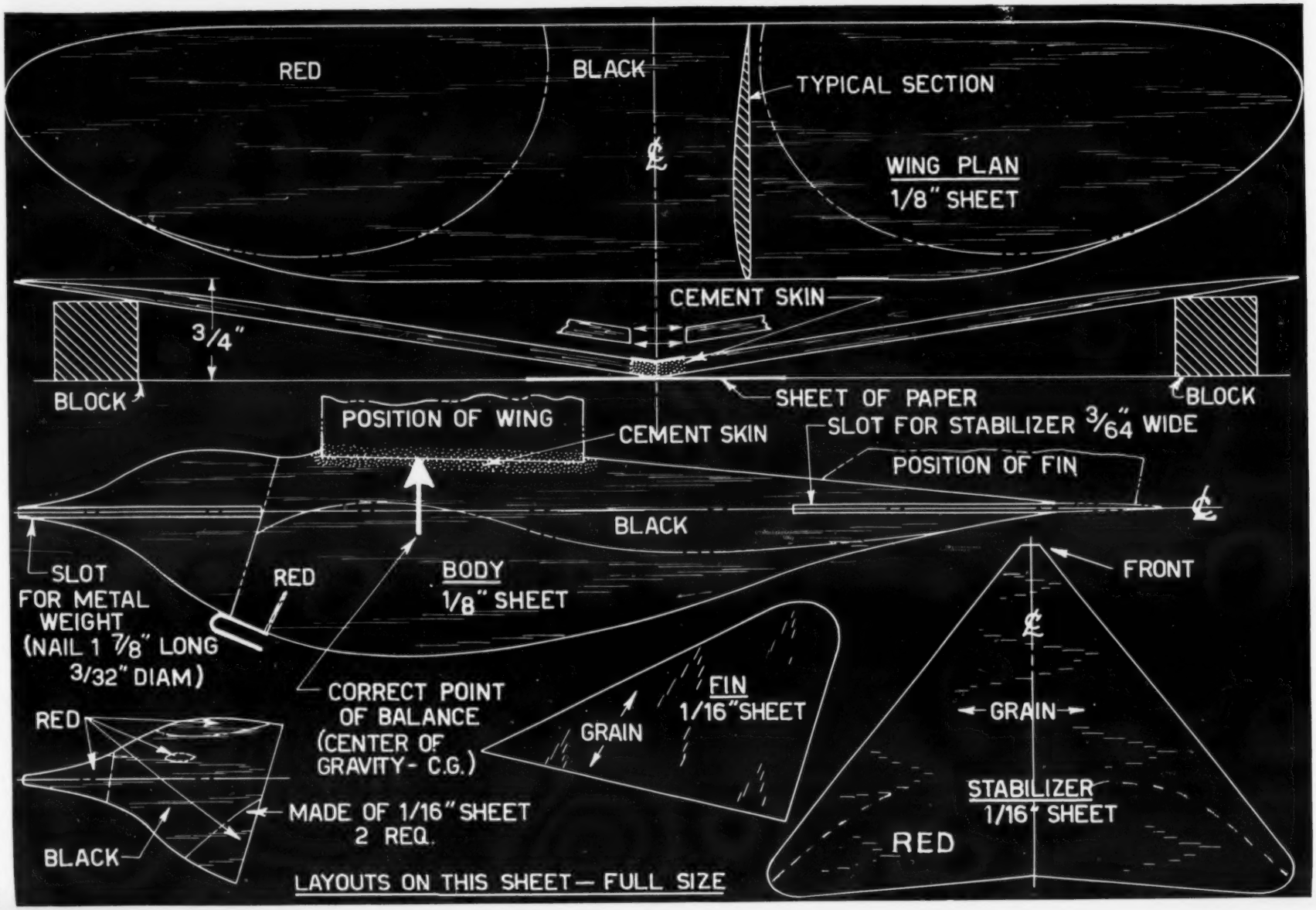
For aviation is going to be taught in the secondary schools, many of which are even today laying plans, training teachers, shopping for text books, and building or buying teaching materials.

This "fly or die" phrase needs some explanation, since it is the basis for the educational program which your government is originating and making available to all the schools of the country. Of course, I do not mean that if we fail to fly we will be physically wiped out; that 130,000,000 of us will be killed. I mean that unless we affirm our rights as free men, and unless we defend them with the best tools available, and I mean with airplanes, some windbag who calls himself Fuehrer or Duce or Dictator will rise up and take charge of us. Several men are trying to do that today.

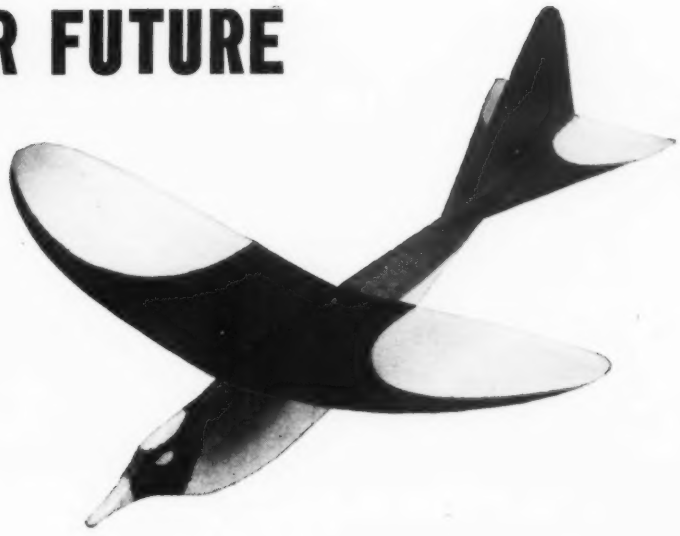
But more than that—if, after the war, we fail to take wings, we will not endure as a nation in this world. We can no more go back to the age of the buggy, or even stay in the age of the motor car

(Continued on page 50)

Educational and model leaders meet to help map the national Junior Aviation program. Left to right: Dr. Gordon O. Wilber, Russell Nichols, Charles Grant, Emerson E. Neuthardt, Charles Penn, William Winters, Irwin Polk, Edward Miller and Arthur Vhay


RED
BLACK
TYPICAL SECTION
WING PLAN
1/8" SHEET
CEMENT SKIN
3/4"
BLOCK
SHEET OF PAPER
BLOCK
POSITION OF WING
CEMENT SKIN
SLOT FOR STABILIZER 3/64" WIDE
POSITION OF FIN
BLACK
SLOT FOR METAL WEIGHT (NAIL 1 7/8" LONG 3/32" DIAM)
RED
BODY 1/8" SHEET
FRONT
CORRECT POINT OF BALANCE (CENTER OF GRAVITY - C.G.)
FIN 1/16" SHEET
GRAIN
GRAIN
RED
MADE OF 1/16" SHEET 2 REQ.
BLACK
STABILIZER 1/16" SHEET
RED
LAYOUTS ON THIS SHEET — FULL SIZE

MODELING YOUR FUTURE IN AVIATION



Official Air Youth course in elementary aeronautics

by

CHARLES H. GRANT

ARTICLE 2

Building Your First Model Plane—the Bird Glider

EXPERIMENTING with model planes gives an understanding of principles of designing, building and flying full scale airplanes that cannot be attained by merely reading books. Models demonstrate principles like lift and stability, books only tell about them, leaving their application still to be demonstrated through models or man-carrying planes in actual flight.

So like aviation's pioneers and many successful present day aeronautical men, you can start to build your aviation career now by experimenting with model planes.

The first models conceived by early experimenters were patterned from birds which will serve also as an excellent pattern for your first experimental plane.

Elementary consideration shows that a bird has all essential parts or characteristics required for flight. 1. Wings for lift and support; 2. Flexible wing tips that bend to propel the bird forward when it flaps its wings, or ability to glide with wings motionless when gravity pulls it forward and slowly downward; 3. A tail and movable wing tips to give balance and keep it steady in flight; 4. A body to join together all essential flight parts; and 5, legs for taking off and landing.

If your bird model embodies all of these in one form or another it will be capable of flight.

First consider the wings: Can they be made like a bird's? Not exactly for a bird's wing is flexible and moved in flight to retain balance as well as generate propelling force. The model's wings must be made rigid, giving lift and support but generating no driving force. Birds do not flap their wings when gliding or soaring but hold them motionless except for slight flexture of the tips for balance. So the model must assume the characteristics of a soaring bird, gravity providing the propelling force. Lillienthal flew in this type of large plane before motors were invented.

It is a simple matter to equip the model with a tail like a bird, commonly a small horizontal surface rearward of the wings (called a stabilizer). When held rigidly this part keeps the bird or model from nosing down or up from its true flight course. To prevent undesirable turning to one side or the other, the bird flexes its wing tips, creating drag on one tip as required to keep flying straight, a feature used in turning also.

Obviously such control cannot be accomplished through the rigid wings of our model, so other means must be substituted. Airplanes employ vertical tail surfaces to prevent turning sideways (directionally) from normal flight course. So in addition to the horizontal tail surface, the model glider must have a rigid vertical surface, called a fin, as shown on the bird glider pictured on this page. Stabilizer and fin act like feathers at the end of an arrow, steadying the flight.

The wings and tail surfaces of a bird protrude from its body which hold them in definite position and angle relative to one another, thereby providing flight stability. Control is obtained by movement of the surfaces and by changing their angles relative to one another.

So a body is required for the model bird glider: In airplanes called a fuselage. Shaped like a bird's body it is very realistic and provides the means to hold wings and tail planes in correct positions. Obviously neither legs nor other landing gear are necessary for a glider which is either thrown from the hand or catapulted by a rubber band, illustrated in Fig. 8.

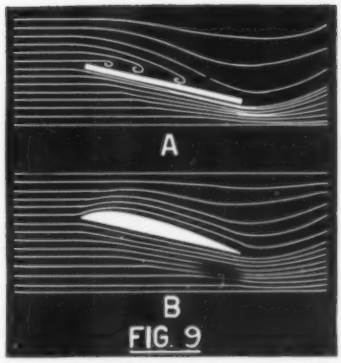


FIG. 9

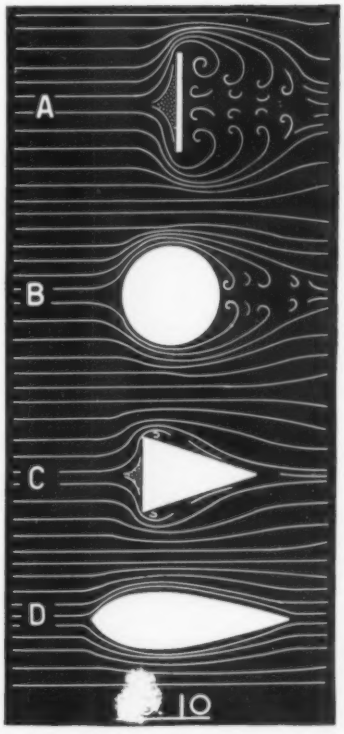
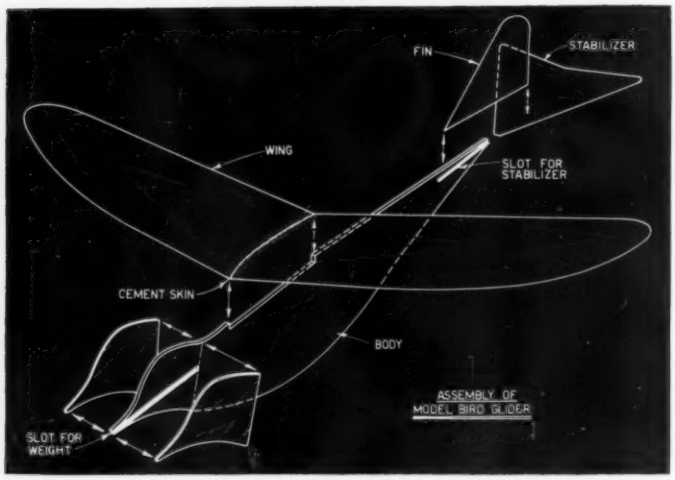


FIG. 10


FIG. 8



Therefore landing gear may be omitted. As a substitute a hook may be placed at the lower forward edge of the body, to engage the rubber of the catapult.

Our bird must have one flying quality which is often overlooked by the inexperienced; it must have balance. When flying, a bird holds his wings in the proper position relative to its center of weight for balance. For correct flight the center of weight must be at a point approximately 30 to 35% of the wing chord back of the leading edge. This point is shown by a heavy arrow on the plans. Usually the center of weight of the model alone is not at this point and a weight must be added to the nose to give correct balance.

Usually we find that the required parts are: 1. Wing; 2. Stabilizer; 3. Fin; 4. Fuselage (Body); 5. Launching hook; 6. Balance nose weight.

Now comes the most important operation. That is, determining the size, proportion and shape of the parts; the bird can act as our guide. Start by determining the span of the wings, for this establishes the size of your glider. 10" will be excellent; not too large or too small, when practice flying is the objective.

The minimum width of the common bird's wing (chord) from leading to trailing edges is about 1/5 the span, not including the chord taper at the wing tips. Engineers call this ratio of span divided by the chord, "aspect ratio"; so we will make our glider with an aspect ratio of 10 divided by 2, or 5. This ratio is slightly more than 5, nearer 6, if based on the average chord over the entire wing span.

The crossection shape of a bird's wing is very important, influencing its lifting capacity and efficiency greatly. If you will examine a bird's wing you will see it is curved from leading to trailing edges, not flat as many suppose. At the leading edge the curve is quite abrupt, reaching a maximum height about 1/3 back along the chord and then curving more gently to the trailing edge. The undersurface curves also but not as much as the upper. The wing is quite thick near the leading edge and gradually tapers to zero thickness at the rear.

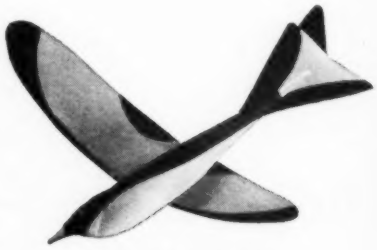
Flat wings are very inefficient because the airflow is broken sharply at the leading edge, causing a turbulence or boiling of the air over the wing; see Fig. 9A. A wing is efficient only when the airflow around it is smooth and unbroken. Therefore if the top surface is curved upward leaving the under surface flat, as shown in 9B, the airflow doesn't break but flows around it smoothly. The lift is increased considerably by curving it in this manner; the higher the curve or the thicker the wing, the greater the lift will be up to a certain point.

Greater lift however causes slower flight, while the glider should fly at considerable speed. A thick wing also makes the glider quite heavy so a comparatively thin wing is used. About 1/8" thick will be satisfactory; this allows a gentle curve from the leading to the trailing edge with its greatest height, 1/8", located about 1/3 of the chord back from the leading edge.

The stabilizer area should be about 3/10 of the wing area; the latter is approximately 18 sq. in., so the stabilizer is 6 sq. in. Birds usually have triangular tail surfaces so if the stabilizer is made with shape and size shown on the drawing it will be about right to insure stability.

Correct fin area is important to hold the model steady; this should be about 1/9 the wing area, about 2 sq. in. By making it triangular as in the drawing it will conform to stabilizer shape, resembling a bird's tail surfaces.

The fuselage or body length depends upon one important element; the distance from the center of wing to the center of tail. Approximately this is 1/2 the wing span or slightly less, but never less than 4/10 of the span. Distance of the nose from the center of wing is usually about 1/2 this length, so our fuselage should be approximately 2 1/2" plus 5" or 7 1/2" long. It will be shaped to resemble a bird's body which is an excellent example of a streamline form.



Bird glider in flight

One of the most important considerations is the angle between tail and wing. The tail at the rear of the fuselage should be parallel with its axis. The wing should be slanted slightly upward giving it a positive angle to the fuselage centerline.

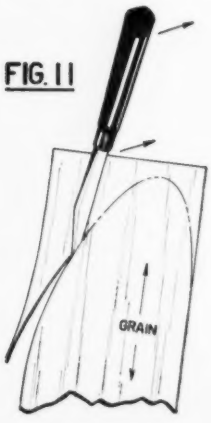
The chord angle is established by raising the leading edge 1/16" more than the trailing edge above the centerline parallel to the stabilizer. This approximately is 2 degrees when the wing chord is 2", so when shaping the body be careful to cut the wing groove at this angle relative to the slot holding the stabilizer.

Naturally the more resistance to forward motion the more power is required for flight, and nature has formed the bird's body so it will slide through the air easily. An excellent example of a streamline form around which the air flows smoothly is shown in Fig. 10D. Any angular or irregular form always gives greater resistance (drag) than a curved shape.

Greatest resistance results when a flat plate is moved through the air perpendicularly to the line of motion, as in Fig. 10A. The motion causes a vacuum in the back of it and excessive turbulence; consequently high resistance results. Fig. 10B shows airflow around a cylindrical object; this gives less resistance than the flat plate because the turbulence is reduced by its

(Continued on page 62)

FIG. 11



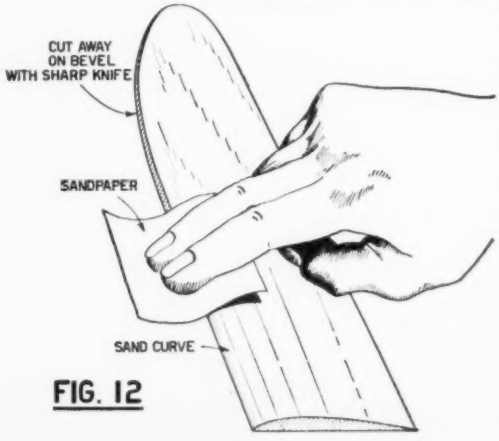
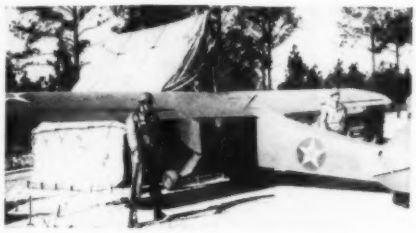


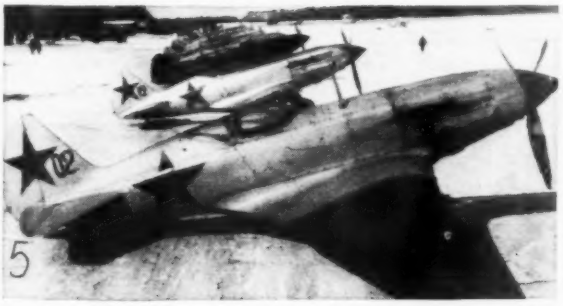
FIG. 12

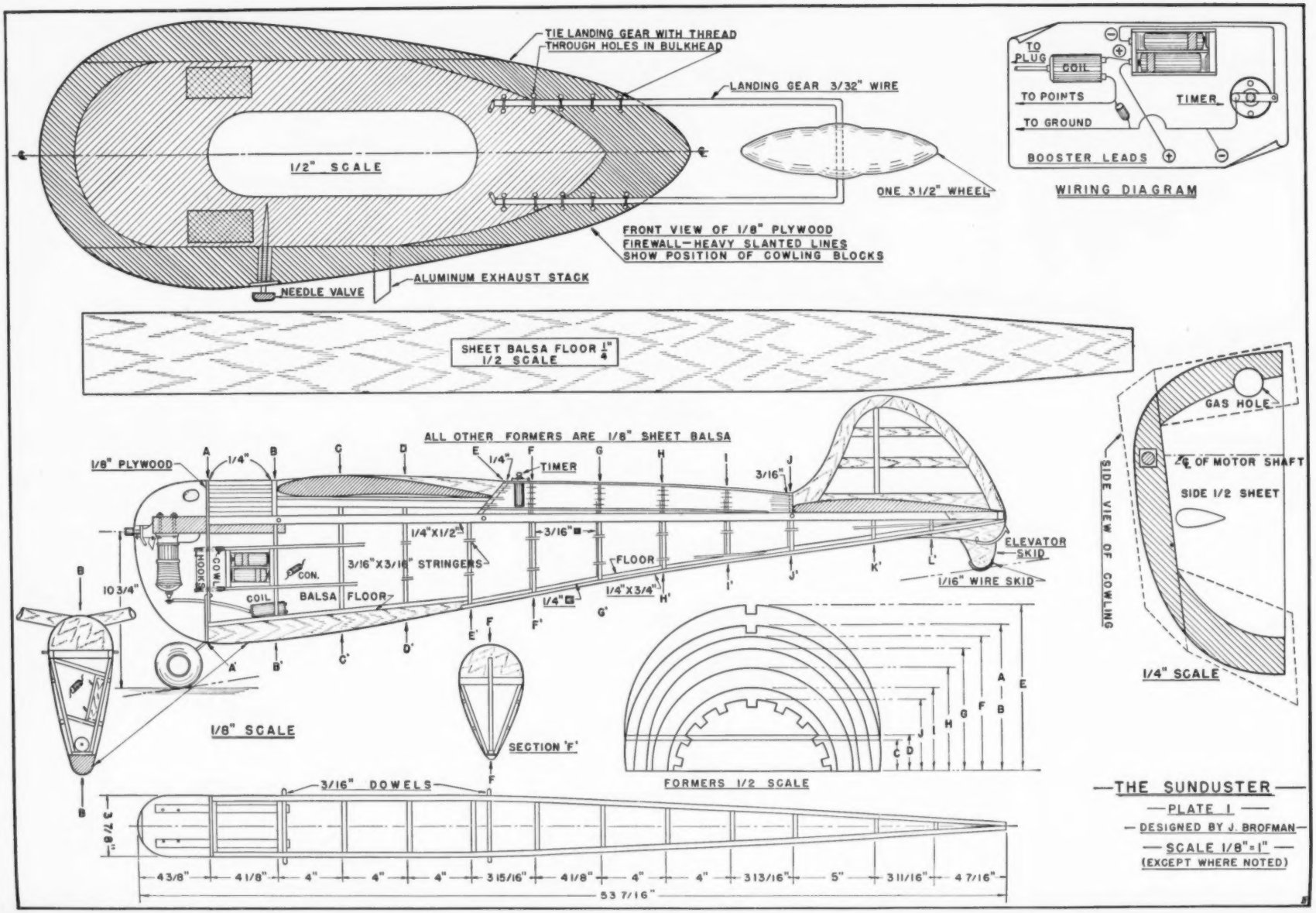
FRONTIERS

Planes that are making world history

(1) A Cub artillery spotting plane sticks its nose into a tent so the engine can be overhauled, free from blowing sand. (2) The Curtiss Warhawk, latest high climbing pursuit for the Army. (3) Australia is now producing this Wirraway pursuit in quantity. (4) Soviet bombers on a mission—this picture gives an indication of their modern design. (5) Soviet I-18 pursuit planes ready for action; heavily armored and armed with two 20 mm. guns and 4 machine guns; their high speed is more than 340 mph. (6) The Curtiss 0-52 observation plane, used extensively by the US Army in all actions. (7) North American B-25 bombers, the type that bombed Japan under leadership of Brig. Gen. James Doolittle.







THE SUNDUSTER

PLATE I

DESIGNED BY J. BROFMAN

SCALE 1/8"=1"

(EXCEPT WHERE NOTED)

STRATOFLY THE SUNDUSTER

Complete data for building a reliable one wheel gas model with sensational glide

by **JERRY BROFMAN**

FOR the last two years in the gas model world, there has been an ever increasing demand for high performance. "The Sunduster" appears in response to this demand. This ship has been designed with extra large wing area for its size of motor displacement in order to promote excellent soaring qualities, which is essential for a contest ship. The other requirement is the climb. To achieve these qualities the ship was designed to incorporate the following features:

1—A long nose moment to help it hold its course.

2—A thin airfoil to give it speed on the climb and less drag.

3—A completely cowled and inverted motor in a streamlined, light efficient fuselage to reduce drag and give it a fast climb.

4—Large elevator surfaces to prevent stalling and induce stability.

5—Light, strong and easy to build structure.

The Sunduster was taken to the model flying field at Creedmore, L. I., for testing. It was found to have one of the most sensational glides ever seen in a gas model. Its first power flight was with the motor running very slowly; at the end of ten seconds the motor cut, and she pulled out into a smooth graceful glide which lasted one minute and forty seconds.

It was noticed during the flight that upthrust was needed in the motor. The ship was retrieved, the cowl removed, and two small washers were inserted under the two rear bolts to give it the required upthrust. Two more flights were then made with the motor advanced two notches. The times of the two flights were 3:21 and 3:56 respectively, each on a *ten second motor run.* All of these preliminary flights were made with a low pitched, thin bladed 14" prop.

Its designer and a few of the trophies it has won

A higher pitched *wide bladed* 14" prop was added, and the motor was revved one notch more, which was only half speed. This flight was *sensational!* She climbed like a bullet, and after *seven seconds* the motor cut, and she started on a glide that lasted *five minutes and twenty seconds.*

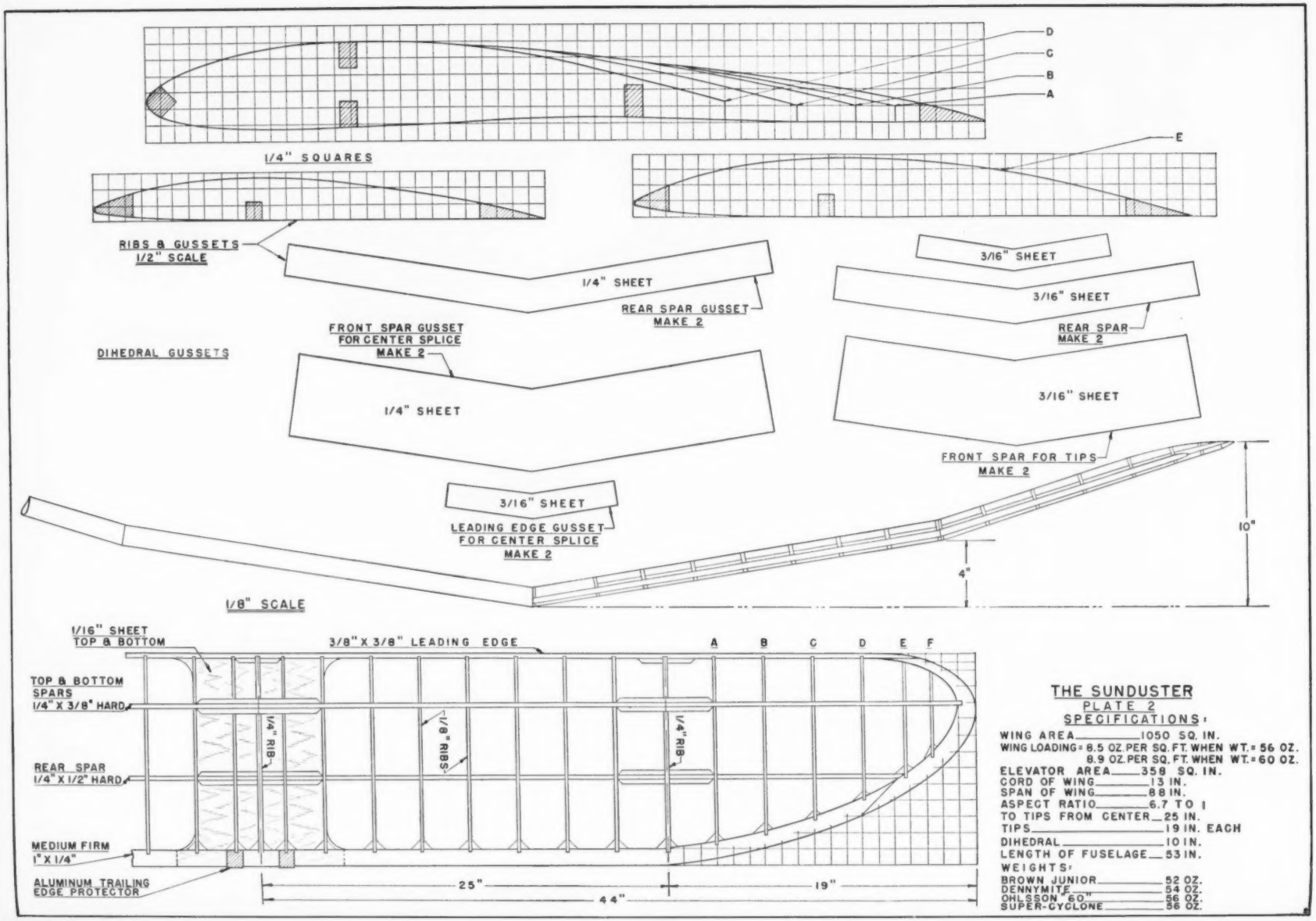
On the next flight the motor was opened still higher, and she was let loose. She pointed her nose skyward and spiraled up. When the motor cut she leveled off into a slow, flat turning glide to the right. We followed the ship for about twenty minutes as she lazily drifted across the afternoon sky. The total time of the flight was 27:25 on a *ten second motor run!* This flight proved the ship to be definitely the superior contest plane that every modeler is looking for. Here it is. The Sunduster—so see what you can do with it.

BUILDING AND FLYING—First, you must scale the plans to working size.

Follow the scale on the plans; then carefully study all the plans.

To build the body, first build the crutch out of 1/2" x 1/4" hard firm balsa. Then cut out all the top formers and glue in place onto the crutch. Cut out the firewall from 1/8" plywood, and cement onto the crutch at first 1/4" balsa former. At this point, cut out the 1/4" sheet balsa floor and glue on the firewall as indicated on the plans. Then cement the 3/16" square braces from the crutch to the floor. When this is done, lay the rear 1/4" square longeron on the body, getting the correct curve by cementing 1/4" x 1/8" braces flat on the rear bulkheads—then cement the 3/16" square braces, getting their length from your scaled up plan. Glue on the bottom longeron of 1/4" x 3/4" hard balsa on the 1/4" square. Reglue all the joints on the fuselage. When dry, put on the stringers of 3/16" square. After the stringers have dried, glue in the 1" x 1/2" x 8 1/4" gum or basswood motor mounts.

Bend the landing gear from a length of 3/32" steel wire. Remember to put a 3 1/2" sponge rubber wheel in first. A sponge rubber wheel is recommended, because the way the wheel is mounted on the landing gear it cannot be removed. If it were an airwheel and got punctured, it could not be changed. The landing gear is then tied to the firewall, first with milk bottle wire, then with heavy thread, then it is cemented a few times. Then cement the 1/8" stringers to the rear bulkheads, and cement the wing platform onto the body. Cement the dihedral guide of 1/2" x 1/4" hard balsa onto the wing platform.



THE SUNDUSTER

PLATE 2

SPECIFICATIONS:

WING AREA	1050 SQ. IN.
WING LOADING	8.5 OZ. PER SQ. FT. WHEN WT. = 56 OZ. 8.9 OZ. PER SQ. FT. WHEN WT. = 60 OZ.
ELEVATOR AREA	358 SQ. IN.
CORD OF WING	13 IN.
SPAN OF WING	88 IN.
ASPECT RATIO	6.7 TO 1
TO TIPS FROM CENTER	25 IN.
TIPS	19 IN. EACH
DIHEDRAL	10 IN.
LENGTH OF FUSELAGE	53 IN.
WEIGHTS:	
BROWN JUNIOR	52 OZ.
DENNYMITE	54 OZ.
OHLSSON "60"	56 OZ.
SUPER-CYCLONE	56 OZ.

IGNITION—You will notice in The Sunduster that the ignition is enclosed completely in the fuselage (except the battery box) and cannot be tampered with, without cutting away the silk. This means that a perfect ignition *must* be installed. The plan should be followed as to position of coil, battery box and timer. The coil should weigh about 2 ounces, and the batteries should be intermediate cells, as weight and balance are important. If the motor weighs more than a Super Cyclone (7 1/2 oz. bare), the coil must be shifted back 1" for every extra ounce up to 11 oz. motor weight. All connections should be soldered, and made with a good grade of heavy stranded wire.

COWLING—The cowling is beautiful when finished and it is pretty easy to construct. First, cement the five rough balsa blocks together. After these have dried, cut to the rough oversize shape of the firewall. The motor should be mounted before finishing, as your mounting may vary in some respects.

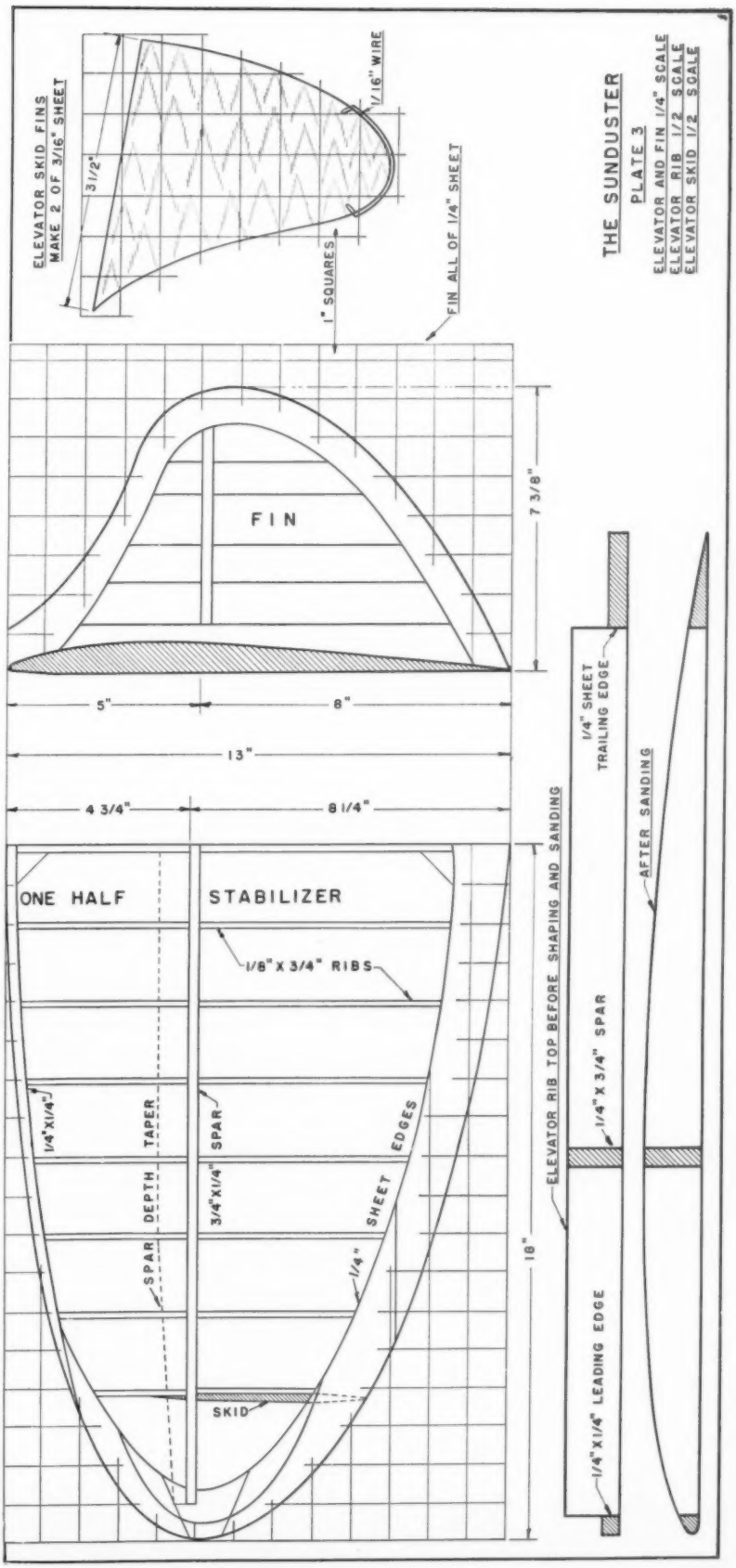
The cowling is determined by slipping the block over the nose, and letting the motor make an impression on the soft wood. Cuts and sandings may be made to allow better fit until the block finally rests flush against the firewall, and the motor is completely enclosed. If the Super Cyclone is used, the whole front must be left open so the carburetor (air-intake) can function properly. The holes for exhaust and gas can be made now.

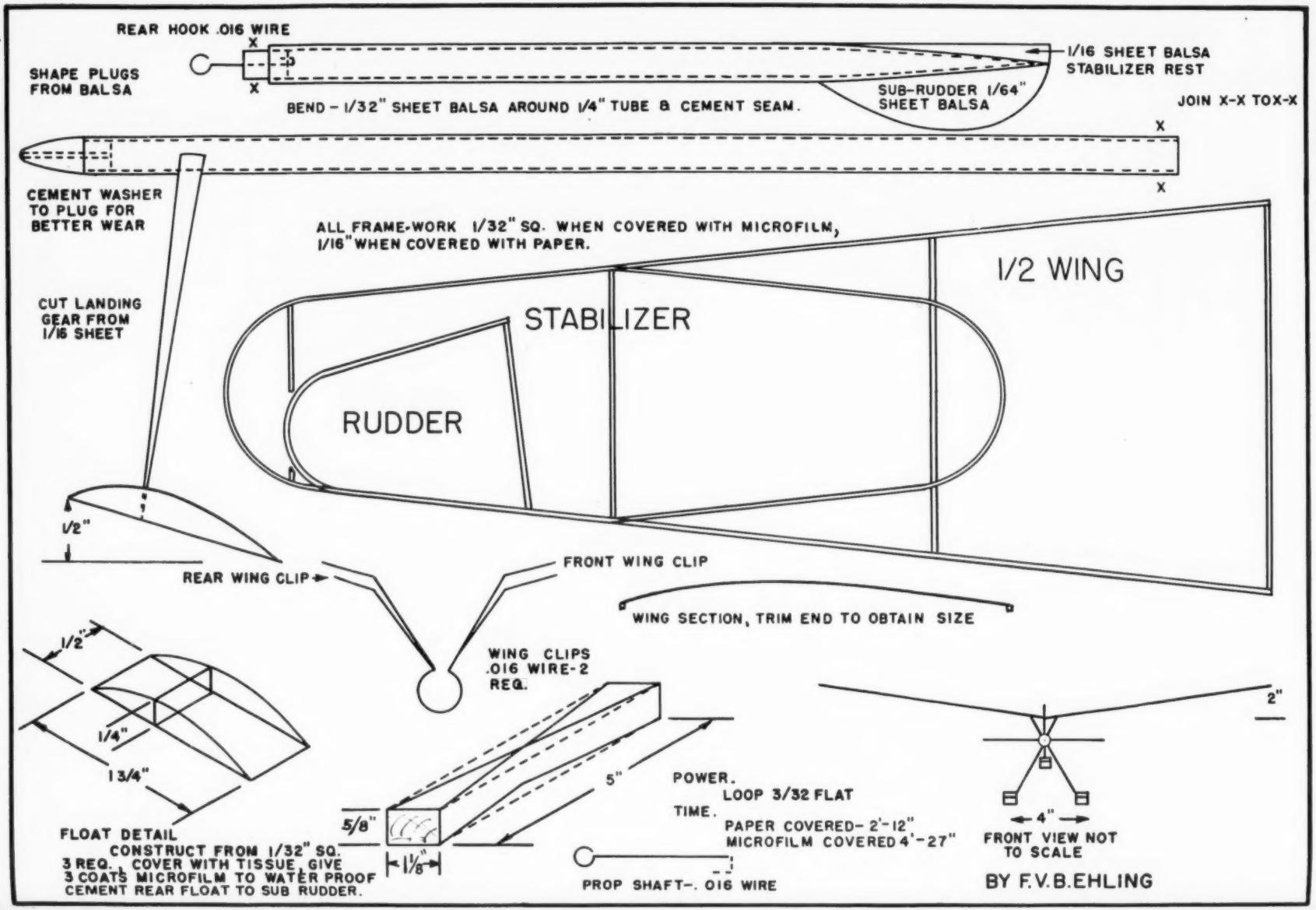
The final forming of the cowl is done with a sand block, plenty of elbow grease, and an eye to the outline of the ship. Start with coarse 1 1/2 sandpaper to fine 4/0 sandpaper. Then give the cowl about two coats of wood filler and sand with 10/0 sandpaper between coats. After this give it about ten coats of cement *inside* and out, sanding between each coat. Now it is ready for the final color doping.

FINISHING FUSELAGE—After the cowl and ignition are in, the sub-rudder is formed and cemented in place. From 1/16 steel wire bend a hook for rubber to fit on the sub-rudder to hold on the elevator. The bottom block is carved from a piece of 1 1/4" x 1 3/4" x 16" medium balsa, and *should not* be hollowed out. It should be rounded to conform with the firewall and plan shapes. Then finish with wood filler and glue. All joints should be cemented thoroughly at least two or three times. The entire fuselage is now sanded completely and should be covered with silk. The silk should be clear doped at least five times, and should be colored doped at least in the front with three coats of your favorite color.

TAIL ASSEMBLY—The elevator surfaces are built in the conventional manner. The main spar—which is of 1/4" x 3/4" hard balsa—is tapered before it is pinned onto the plan, and the leading and trailing edges are then pinned on the plan. The ribs (which you will note are *not* cut to an airfoil at this stage) are inserted. After the assembly is dry, remove from plans and reglue. When dry the entire assembly is cut, including ribs, by free hand to eye curve and sanded to shape. Remember to

(Continued on page 56)




REAR HOOK .016 WIRE
SHAPE PLUGS FROM BALSA
BEND - 1/32" SHEET BALSA AROUND 1/4" TUBE & CEMENT SEAM.
1/16 SHEET BALSA STABILIZER REST
SUB-RUDDER 1/64" SHEET BALSA
JOIN X-X TO X-X
CEMENT WASHER TO PLUG FOR BETTER WEAR
ALL FRAME-WORK 1/32" SQ. WHEN COVERED WITH MICROFILM, 1/16" WHEN COVERED WITH PAPER.
1/2 WING
STABILIZER
RUDDER
CUT LANDING GEAR FROM 1/16 SHEET
1/2"
REAR WING CLIP
FRONT WING CLIP
WING SECTION, TRIM END TO OBTAIN SIZE
WING CLIPS .016 WIRE-2 REQ.
1/2"
1/4"
1 3/4"
FLOAT DETAIL
CONSTRUCT FROM 1/32" SQ. 3 REQ. COVER WITH TISSUE, GIVE 3 COATS MICROFILM TO WATER PROOF CEMENT REAR FLOAT TO SUB RUDDER.
5/8"
1 1/8"
5"
POWER.
LOOP 3/32 FLAT
TIME.
PAPER COVERED- 2'-12"
MICROFILM COVERED 4'-27"
PROP SHAFT-. 016 WIRE
2"
4"
FRONT VIEW NOT TO SCALE
BY F.V.B.EHLING

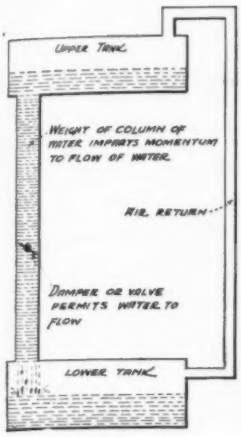


Fig. 1. A water analogy of the flow of an electrical current through a circuit.

THE PHYSICS OF THE AIRPLANE

ELECTRICITY

by **W. L. NYE** *and* **J. P. EAMES**

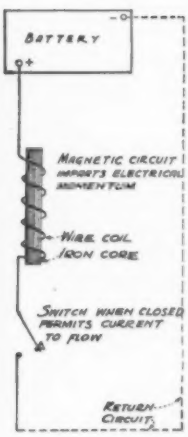


Fig. 2. A typical electrical circuit comparable to the water analogy shown in Fig. 1.

MAGNETISM and electricity play a very definite part in the performance of the modern airplane. For instance, the aircraft engine magneto performs directly as a function of magnetism; an armature with a coil being rotated within the confines of the magnetic field of a powerful magnet, generating current which in turn ignites the atomized fuel in the combustion chamber. Another instance, becoming more and more a part of the flying forces, is the use of radio and special equipment for precise navigation in thick weather. These are just a few isolated instances where electricity and magnetism play an important part in modern aviation. Without the miniature ignition coil, based upon the principles of magnetism and electricity, gasoline propelled model aircraft would not be possible.

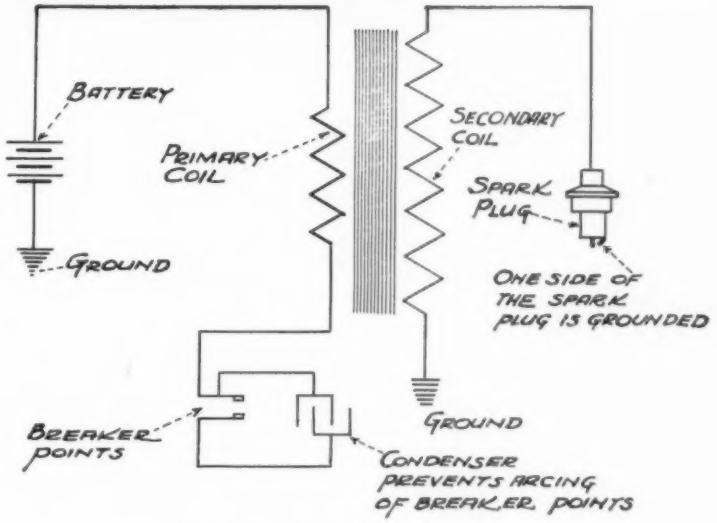
A magnet, whether natural or artificial, possesses the dual properties of attraction of certain metals to its extremities, called for convenience "poles," and also of aligning itself in one particular direction when suspended where it is free to swing. The natural magnet is the lodestone; certain suitable materials can be inserted within the influence of a magnetic field and become, in turn, artificial magnets.

The two poles of a magnet are designated the north and south pole. The first law of magnetism states that like poles repel each other, while unlike poles attract each other. We immediately tend to question this statement. How then does the north pole of a magnet become attracted to the north pole of the earth?—as is most certainly the case with a magnetic aircraft compass.

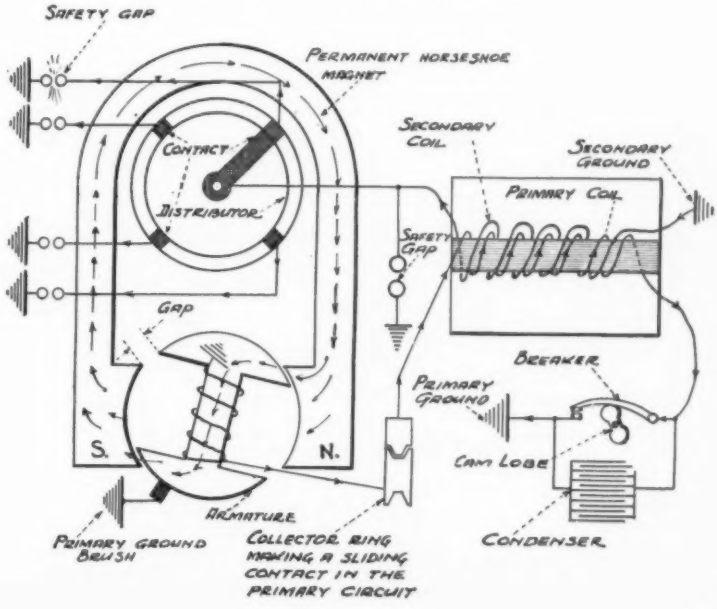
This requires further classification of our initial terminology. The north pole of the magnet is, in reality, the north seeking pole and the south pole is the south seeking pole. This designation of north and south poles holds true wherever electrical generators of direct current are involved such as are found on the aircraft electrical systems in many instances.

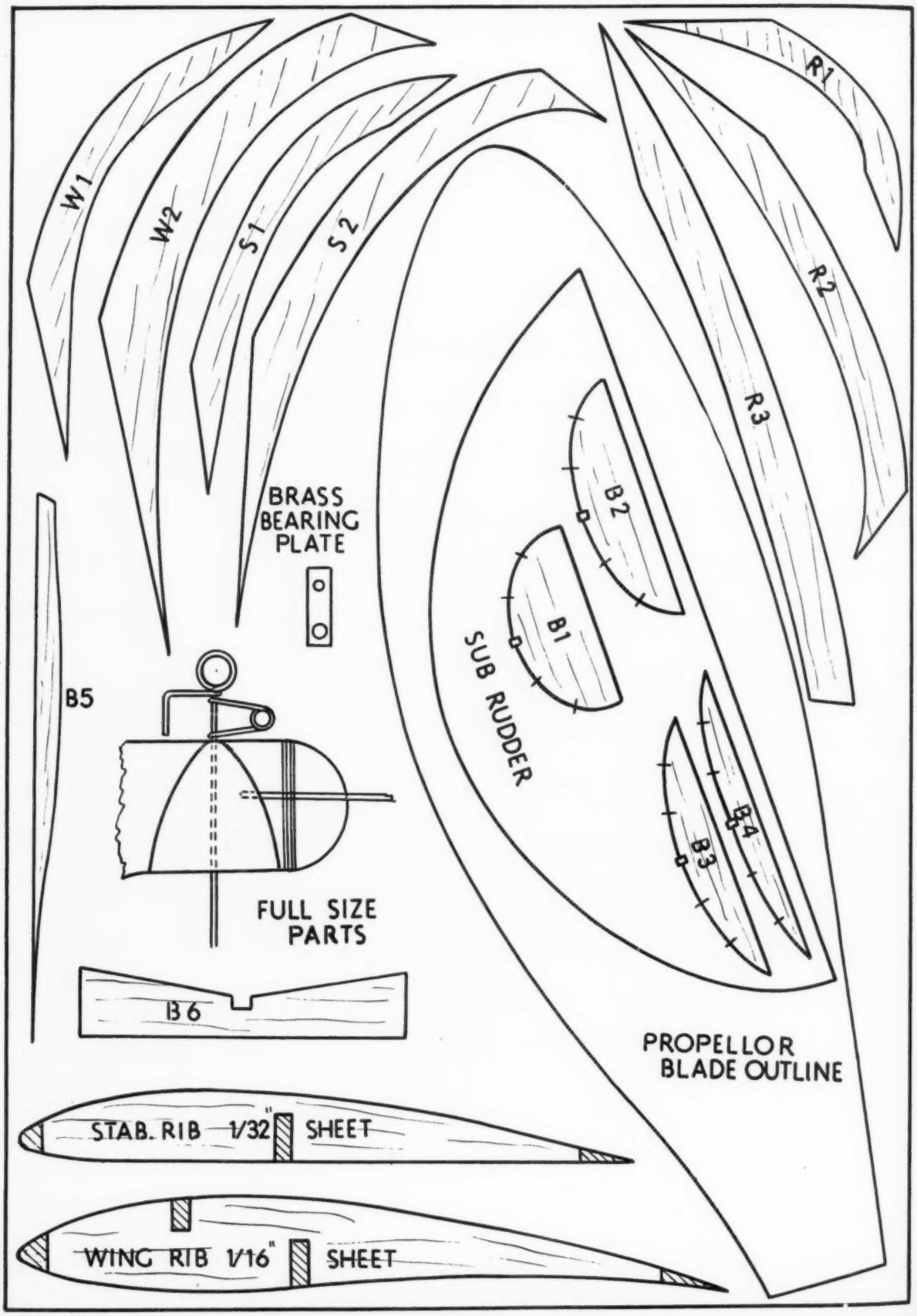
We find an excellent application of the artificial magnet in the field of aeronautics in the needle of the magnetic compass used to guide aircraft over long distances. Because the earth's geographic poles and the magnetic poles do not exactly coincide, an error designated as

(Continued on page 36)



(Above) Fig. 3. A spark ignition coil intended for use with an internal combustion engine.
(Below) Fig. 4. A typical aircraft magneto.



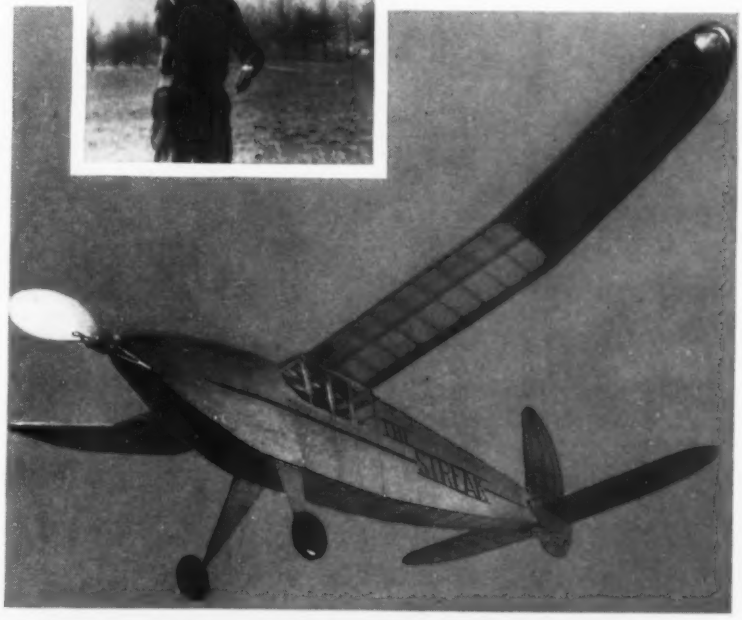

W1
W2
S1
S2
R1
R2
R3
BRASS BEARING PLATE
B5
B2
B1
SUB RUDDER
B4
B3
FULL SIZE PARTS
B6
PROPELLOR BLADE OUTLINE
STAB. RIB 1/32" SHEET
WING RIB 1/16" SHEET

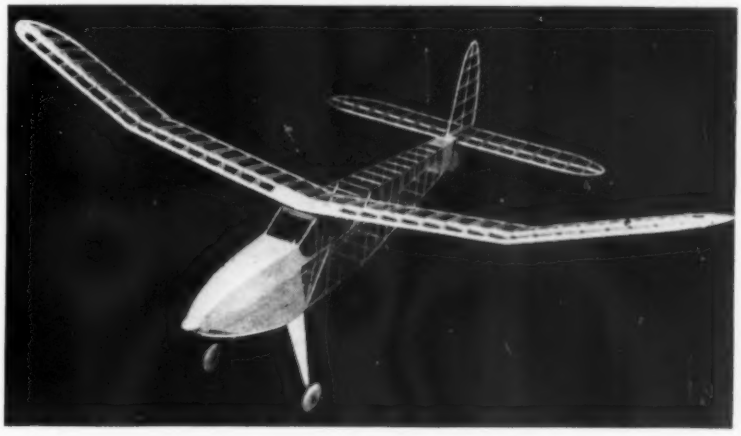
FLY THE "STREAK" TO VICTORY

One of the most consistent flying contest fuselage models ever to take wing—How you can build and fly it

by **TED JUST**

A long fuselage provides long motor run and great steadiness in flight. A one blade prop insures efficient use of power. The uncovered frame shows its simple but sturdy construction





HERE is the model you have been looking for in preparing for that next contest. It is easy to build, a pleasure to fly and a super contest performer.

The original flew right off the drawing board. Its large size gives a majestic attitude in flight. Under the initial burst of power it climbs steeply up and straight away; as the power becomes less, the right turn becomes tighter and the model slowly glides over head.

The one bladed prop has no hindrance to the glide but gives a superior climb, and incidentally is easier to construct because you need not tinker with a hinge or have trouble finding a correct folding position. The landing gear absorbs all the shock but is still rigid enough to allow those realistic landings every time. A large stabilizer is used to lift the model up after the initial zoom which is so steep as to cause most models to stall.

In Cleveland last summer, at a time when no other models were staying up on thermals, the original was lost out of sight due to its ability to withstand strong winds and pick up the slightest thermals. Since then another has been built and test flown perfectly without a bit of adjustment needed. So get ready to build one yourself; you can be assured of the same kind of perfect flying if you will follow the plans carefully.

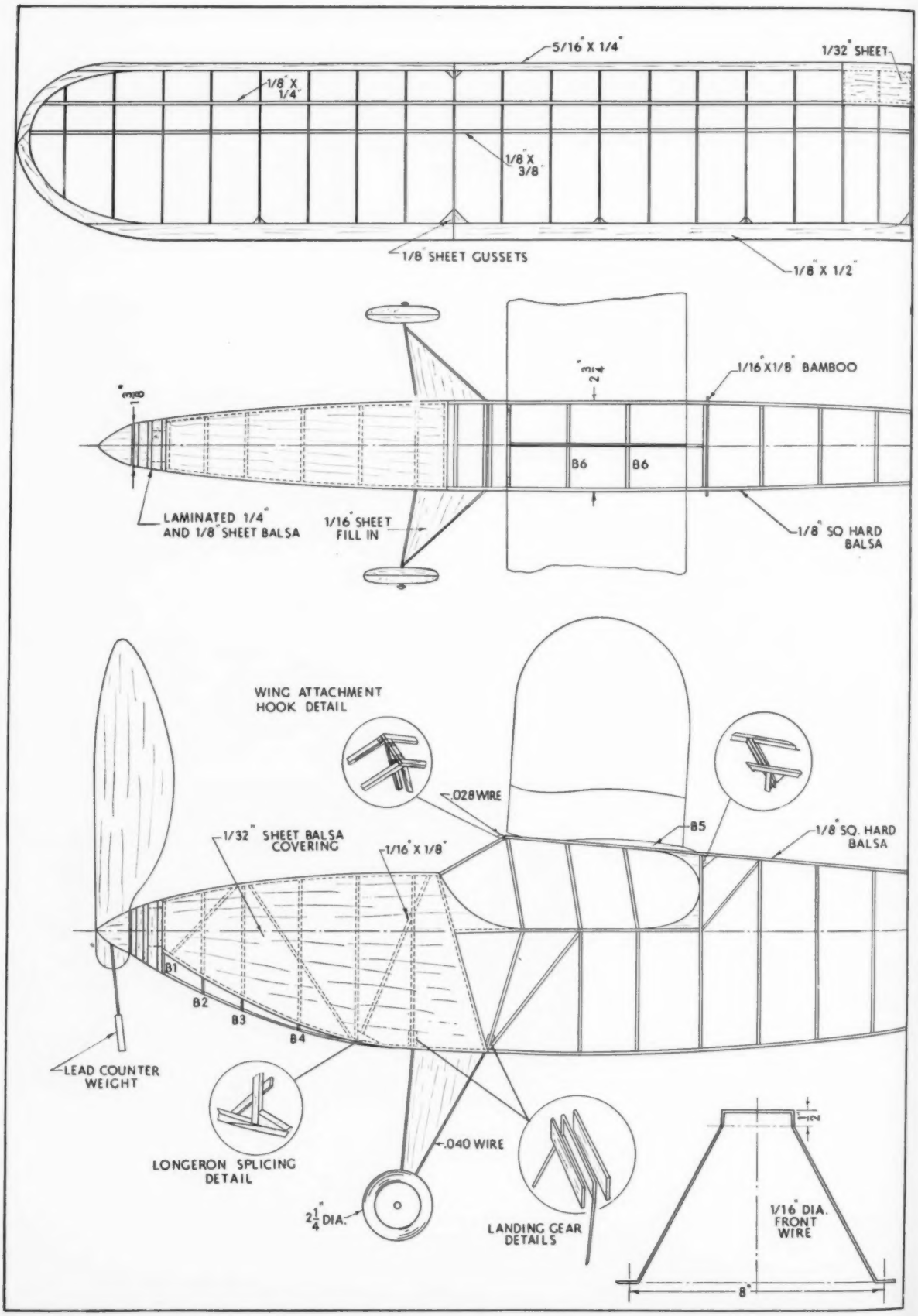
Construction—Begin construction of the model by first making full size drawings of the various parts. The plan is one-quarter actual size, so with a pair of dividers the new drawings can be quickly made.

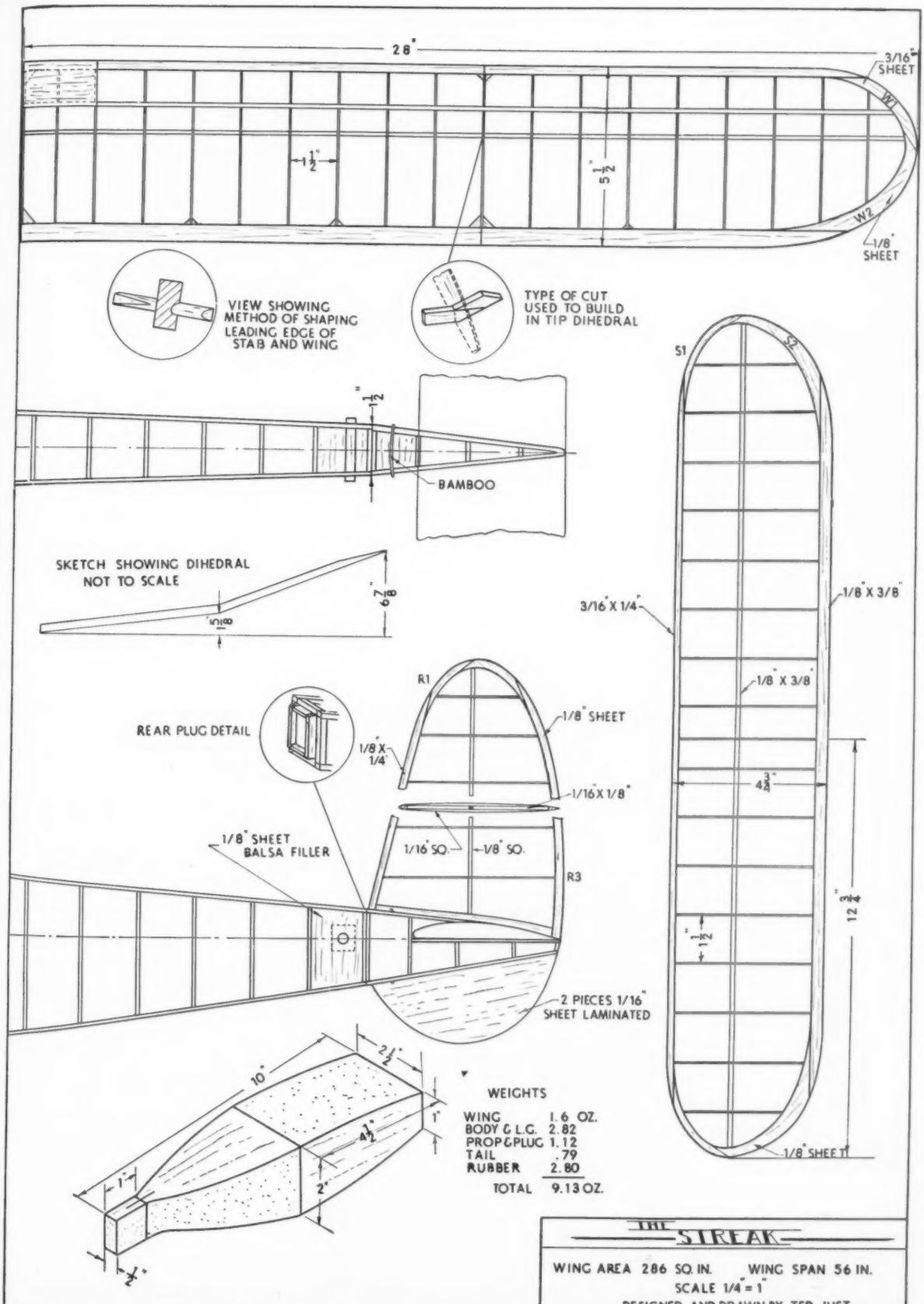
Fuselage—Select four hard 1/8" square balsa pieces for the main longerons. Start the actual construction by building one side of the fuselage on a flat surface. Next build the other side directly on top of the first so that the two are identical. Upon drying they are split apart with a razor blade and placed parallel to each other but perpendicular to the working table. The cross braces are then added, first at the wing mounting section, while the sides are pulled together at the tail and the nose braces added. The remainder of cross braces are now added, also the nose formers and 3/32" square balsa stringers.

The landing gear wires are next formed; the front being from 1/16" diameter steel wire and the rear brace from .040 wire, long enough to slope forward and be bound to the front wire by thread. The wires are held in the fuselage by sandwiching them between balsa at the top and gluing while under pressure in a vise. The landing gear wires are filled in with 1/16" sheet balsa, and the union between the balsa and wire covered with silk to prevent splitting. Small wire hooks to hold the wing attachment bands are next glued in place as well as the bamboo piece just aft of the wing mount.

The nose is now completely covered with 1/32" sheet balsa. It is held in place with pins while drying and sanded to a smooth finish afterwards. The balsa nosing is made by laminating 5 pieces of balsa, the first three forming the nose plug and the other two being permanently cemented to the body. The window fairings are now added, also the rear plug filler. A piece of aluminum sheet is cemented on the inside of the rear filler to protect it

(Continued on page 48)


5/16" X 1/4"
1/32" SHEET
1/8" X 1/4"
1/8" X 3/8"
1/8" SHEET GUSSETS
1/8" X 1/2"
1/16" X 1/8" BAMBOO
B6
B6
LAMINATED 1/4" AND 1/8" SHEET BALSA
1/16" SHEET FILL IN
1/8" SQ HARD BALSA
WING ATTACHMENT HOOK DETAIL
.028 WIRE
B5
1/8" SQ. HARD BALSA
1/32" SHEET BALSA COVERING
1/16" X 1/8"
B1
B2
B3
B4
LEAD COUNTER WEIGHT
LONGERON SPLICING DETAIL
.040 WIRE
2 1/4" DIA.
LANDING GEAR DETAILS
1/16" DIA. FRONT WIRE
8"


28"
3/16" SHEET
W1
W2
1/8" SHEET
1 1/2"
5 1/2"
VIEW SHOWING METHOD OF SHAPING LEADING EDGE OF STAB AND WING
TYPE OF CUT USED TO BUILD IN TIP DIHEDRAL
BAMBOO
SKETCH SHOWING DIHEDRAL NOT TO SCALE
6 7/8"
1 5/16"
S1
S2
3/16" X 1/4"
1/8" X 3/8"
1/8" X 3/8"
R1
1/8" SHEET
REAR PLUG DETAIL
1/8" X 1/4"
1/16" X 1/8"
4 3/4"
1/8" SHEET BALSA FILLER
1/16" SQ.
1/8" SQ.
R3
12 3/4"
1 1/2"
2 PIECES 1/16" SHEET LAMINATED
1/8" SHEET
10"
2 1/2"
1"
4 1/2"
2"
1"
1/4"
WEIGHTS
WING 1.6 OZ.
BODY & L.G. 2.82
PROP & PLUG 1.12
TAIL .79
RUBBER 2.80
TOTAL 9.13 OZ.
THE STREAK
WING AREA 286 SQ. IN. WING SPAN 56 IN.
SCALE 1/4" = 1"
DESIGNED AND DRAWN BY TED JUST

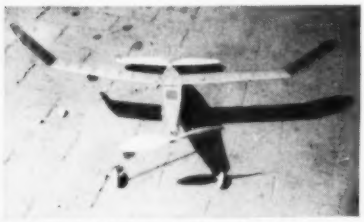
1. Bob Shepard test flies his new gas powered flyingboat

(Right) 2. A rear combination; a high performance contest model with trim lines

AIR WAYS

News of models, builders and activities from all parts of the world

3. A rubber powered Interstate Cadet in full flight



4. H. B. Wells' 36 min. 45 sec. contest model

5. Slotted wings made this semi-scale gas job very stable

Model Airplane Engineer News

THE big news this month is the cancellation of the National Model Airplane Championship Contest that was to be held in Chicago starting July 21st. Many modelers and leaders had been expecting the elimination of the contest during the war, and justly so. It would not only be extremely difficult for model builders to reach Chicago, but we hear from the Chicago Parks District, who sponsors the contest, that transportation from the city to the field would be practically impossible; also that it would be necessary to use another field further from Chicago because of construction work made necessary by the war effort.

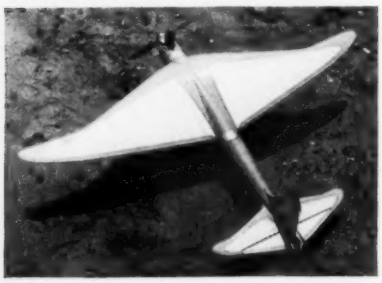
Many other factors contributed to the Academy of Model Aeronautic's decision to cancel the contest. The Chicago contest officials were reluctant to do so and extended themselves to great length to carry on the traditional contest, but so many obstacles presented themselves that the contest would be more of a hardship to the builders than a benefit.

But many local contests are being substituted for the national event. All state and club leaders are urged to carry on sectional meets with added zest and efficiency. This year, in effect, the national contest will be held from Maine to California.

In order not to disappoint thousands of modelers who had hoped to attend the contest, MODEL AIRPLANE NEWS is holding a "remote" national contest—anyone who enters a sectional meet, sanctioned by the AMA and directed by authorized officials, is eligible to receive the two handsome

7. Corporal Wm. R. McNeil building a model P-39 for identification classes at Ellington Field, Texas

6. A U-control model of the Northrop Mantua flown by Art Gray at the Moorestown contest. Bottom three photos and one on opposite page show it ready to go; then she's off at 60 mph and speeds around the course under the grounded pilot's guiding hand



(Left) 8. Leon Shulman with his tether gas job that was so fast it broke loose and went on a rampage. (Above) 9. Harry Apoyan with his super-efficient gas job

trophies offered by MODEL AIRPLANE NEWS. One will be given for the highest time in any rubber event recorded at an AMA sanctioned meet during the month of August throughout the country; the second will be given for the highest time in a gas model event sanctioned by the AMA during the same period.

It is necessary, however, that contest directors register their names, date of the contest and its sponsors at least 3 days before it is to be held. All data should be sent to Contest Editor, MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York City. To be eligible for the award, the contest director should send the results to the above address for recording and inspection. A description of the circumstances under which the flight was made is also required. Those who wish further details concerning this nation-wide affair should write immediately to the Contest Editor.

Model Airplane Engineers

Prospective Model Airplane Engineers are enrolling with great rapidity; there are many names already on the roster. In the near future membership cards will be sent; but do not become anxious if these are not received immediately, for the flood of applications is greater than was expected.

For those not familiar with Model Airplane Engineers: It is an association of model enthusiasts who are primarily interested in model activities as a sport, a science and a means of acquiring education in the field of aviation—their interest is such that these factors alone motivate their activities.

Any such model builder may become a member; enroll by simply filling in the coupon at the end of "Air Ways."

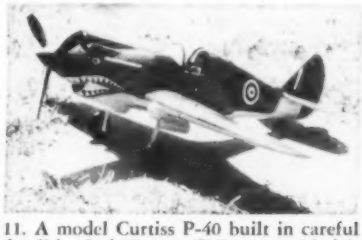
The purpose of the organization is to tie together more closely all serious-minded model builders; to promote an interchange of ideas between them; and to strive continuously for the advancement of model aeronautics. As the organization grows it is contemplated to have occasional conventions, the activities of the association depending entirely upon the will and disposition of its members.

News will be carried in "Air Ways" each month and members are invited to send in their ideas concerning all model activities; as many as possible will be published with the object of making our Model Airplane Engineers column a helpful discussion forum.

Old modelers will remember Peter Bowers of 1218 26th Ave., San Francisco, Cal., as an expert builder; we hear that he is now an Air Corps Engineering Cadet, doing his bit for Uncle Sam. Can you imagine this possible if Peter hadn't participated actively in model aviation? It is interesting to note that thousands of MODEL AIRPLANE NEWS readers during the past ten years are now active either in the

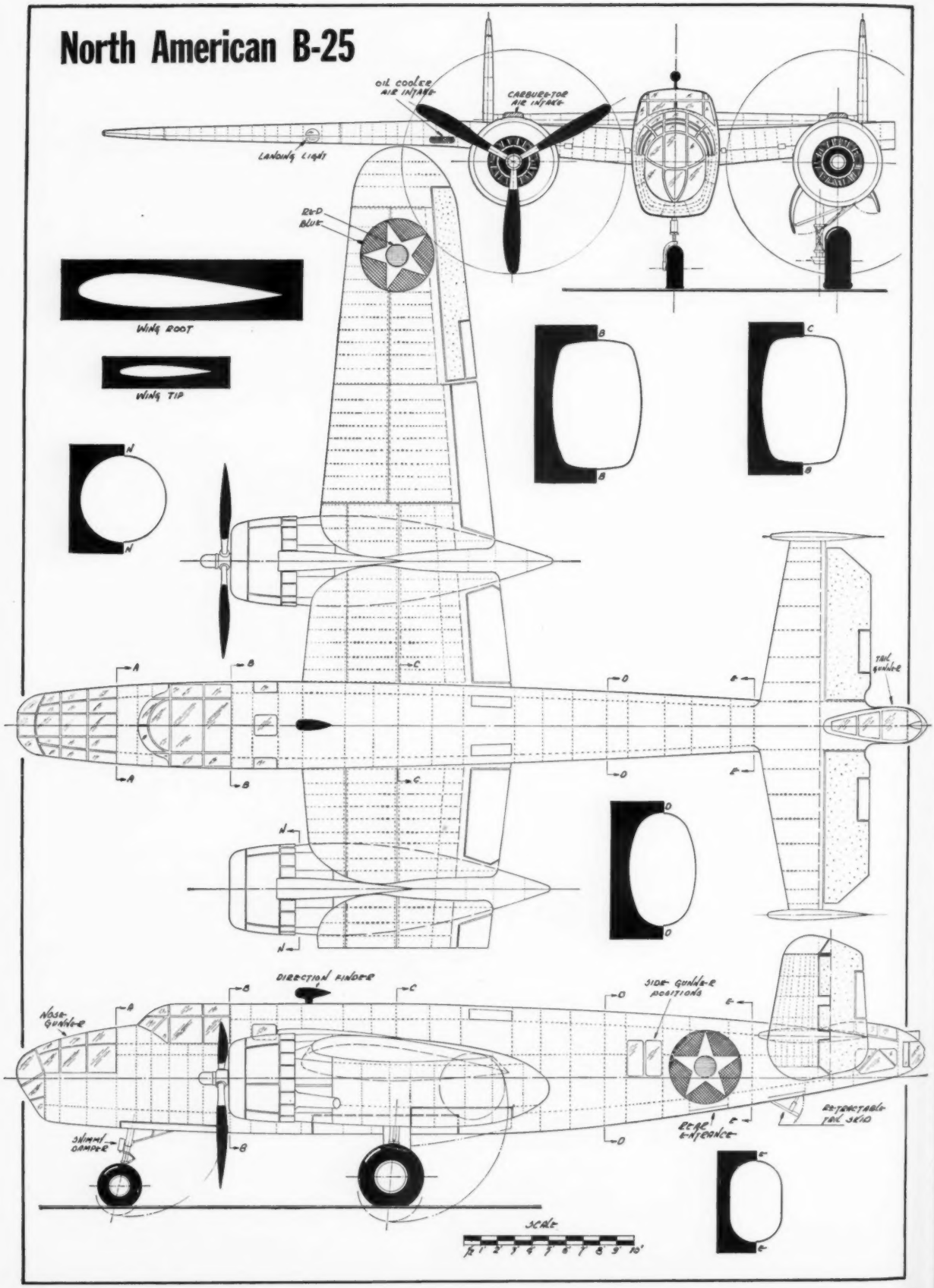
(Continued on page 44)

10. Contestants at Bakersfield contest turn from their planes to watch a test flight



11. A model Curtiss P-40 built in careful detail by Jack Gantz. (Below) 12. Modelers at the Kip's Bay Boys Club of New York turn out models for Uncle Sam's Navy

North American B-25



North American B-25—the plane that bombed Japan

NIPPON NEMESIS

FACETIOUS though it may sound, few have found a better or more apt description of one of the most amazing exploits in military aviation history than radio comedian Red Skelton's ubiquitous "Doolittle Doodit!" For Major General Doolittle DID "doodit" in every sense of the word when he became the first man in all history to lead a successful attack upon the citadel of the "Rising Sun": Tokyo!

The breathtaking mission has assumed mysterious proportions to everyone, except to the man-on-the-street. For, oddly enough, John Doe seems to understand full well exactly how the raid was concluded. Yet it has completely baffled members of the military and aviation professions, particularly those whose concepts of airpower are based on a sound understanding of airplane construction, design and tactical use.

Chief mystery is the takeoff point of the raid, which must have fallen well within the 1750-mile cruising range of the planes used to permit the circuitous route taken and the doubling-back maneuver used over certain parts of Japan. Yet, a circle of 1750-mile radius reveals little on the map of these Far Eastern regions, missing both the known bases on the Aleutian Islands and Alaskan Peninsula and avialable regions in the Philippines or U.S.-controlled Pacific Islands. The possibilities of the raiders being carrier-borne to within striking distance has been repeatedly advanced, but this seems highly unlikely on two counts: the plane types used have a wingspan and takeoff run which would make a carrier takeoff exceedingly risky business and it seems improbable that the strong naval force necessary to support such a carrier would be detached from the Main Pacific Fleet, wherever it may be, or that it would sail in so close to the heavily patrolled Japanese waters.

Only remaining possibility points to the near-truth of President Roosevelt's joking revelation of a hidden base at "Shangri-La," the mythical valley in James Hilton's best-selling novel *Lost Horizon*. For it would appear that the most likely takeoff point for such a raid would lie within China's vast inner reaches. Certainly there is a great deal of territory in China within this 1750-mile circle which is still Chinese-controlled,

Plane on the cover

and quite probably there are many sites which, if they are not established airdromes, might easily be used for the purpose.

The newspapers have revealed the decoration of 79 members of the group which, at the maximum of 6 men per ship, would indicate no less than 13 planes, probably 15 of which would require a base of considerable size together with adequate fueling and servicing facilities.

Brig. General James H. ("Jimmy") Doolittle, leader of the flight, is certainly no stranger to our readers, for his record of brilliant flying and outstanding contributions to the field of aeronautics have distinguished him as one of aviation's all-time "greats." He has revealed all possible facts regarding the flight which would not give "aid or comfort" to the enemy. He says:

"The idea of this particular mission was conceived in January. The airplanes were especially prepared in February and the crews given special training in March. Everything went smoothly from the start. The crews were trained in day and night operations with particular attention to offensive and defensive action at extremely low altitudes. With that training behind us we approached our targets in Japan at tree-top altitude and pulled up to 1500 feet to release our bombs. We were elusive targets and not one plane was shot down in Japan, although they certainly tried with everything they had."

Thus the raid was certainly no hit-or-miss proposition but a long and thoroughly-planned operation involving extensive training of the airmen for weeks prior to the trip. That the planes performed according to expectations, that the tactics worked out smoothly, and that the men did everything they set out to do is borne out by the results of the raid on Tokyo on April 18th, 1942: a direct hit on a new cruiser or battleship under construction at a navy yard south of Tokyo, many incendiary bombs dropped on a quarter-mile aircraft factory near Nogyoa, a tank farm set ablaze and several other objectives hit which could not be closely examined!

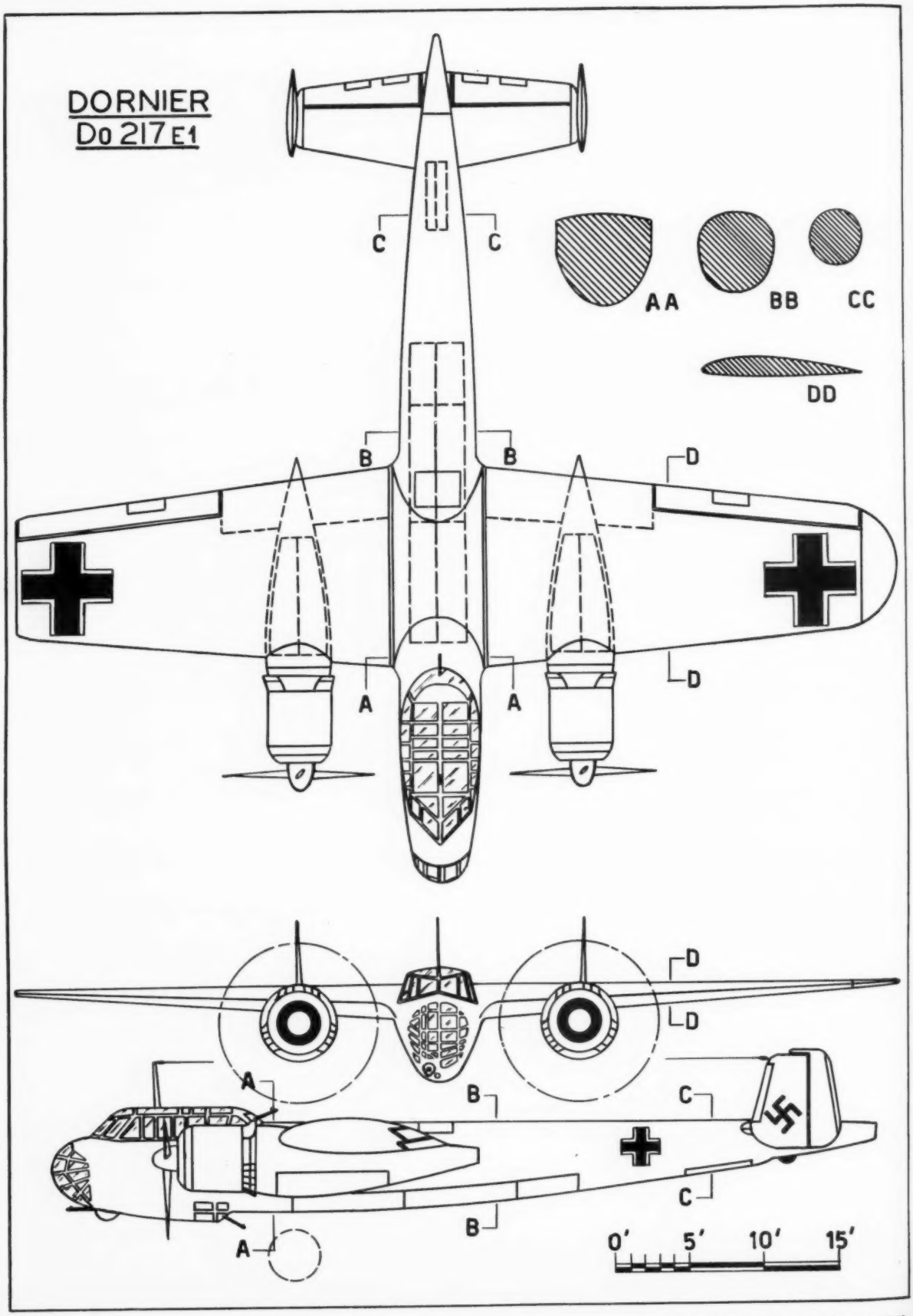
That all due credit should be bestowed upon the airplanes which made the raid possible was evidenced shortly after the return of Doolittle to Washington, where he received the Congressional Medal of Honor, following which he visited Inglewood, California, and spoke to the assembled workmen of North American Aviation Inc. "Here is Shangri-La," he announced playfully, "the place from which our bombers came!" And the bombers to which he referred were of the North American B-25 type, our Plane-on-the-Cover this month.

The B-25 heralded the dawn of an entirely new-type combat type of military airplane: the light, or "medium" bomber that combined the bomb-stowage and load-carrying ability of the bombardment type with the speed, maneuverability and hitting power of the attack plane which it replaced. It is a twin-engine, mid-wing monoplane design with a normal crew of five and adequate bombs and machine guns to perform its many and varied missions.

The wing is built in five major assemblies: main centersection built integral with the fuselage centersection; two outer wing panels; and two removable tip panels attached by screws. Center section is built up on a box beam design comprising two main spars, a leading edge and a trailing section. It houses the engine nacelles and fuel tanks and carries the main gear landing loads through the spars which pass completely through the fuselage. The wing panels are all metal, full cantilever structure, built up on a single spar design with pressed flange ribs, spanwise stiffeners and covered with 24STAL aluminum alloy "Alclad" sheet skin. The ailerons are metal structure fabric covered, equipped with trim tabs controllable, while in flight, from the cockpit. Both outer and inner wing panels carry trailing edge flaps hydraulically operated from the hydraulic selector valve on the pilot's left side. A fixed landing light is mounted in the leading edge of each outer wing panel and the right outer panel carries the airspeed pitot-static head.

The fuselage is in three sections: forward section carrying the nose-gunner-bombardier, the flight crew and controls; center section housing the bomb bay; and aft section carrying the empennage and the tail gunner. The structure is built up on a

(Continued on page 58)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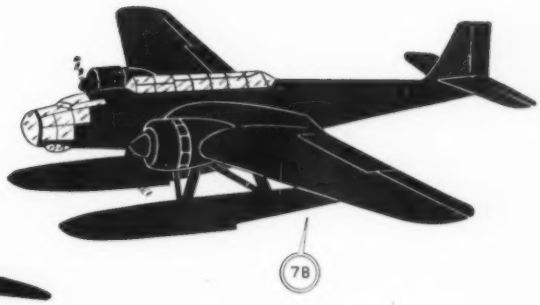
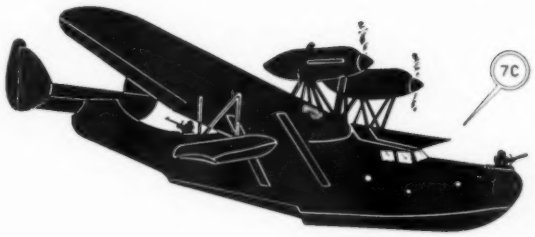




PLANE 7A—The Blohm und Voss Bv 142 four motor troop transport. This is one of the least known of Germany's four motor troop planes even though it is the offspring of the famous Blohm und Voss Ha 139 of trans-Atlantic fame. The Bv 142 is powered with four 830 hp. B.M.W. 132H motors and is capable of carrying 1,440 gallons of fuel. The fuselage is of monocoque design, oval shaped at the front and gradually becoming circular at the tail. Provisions for carrying at least 30 fully equipped soldiers in addition to a regular crew of pilot, co-pilot and radio operator were maintained by the designers. The craft has a wingspan of 96 ft. 9 in.; length, 64 ft. 7 in.; height, 15 ft. 6 in. Wing area is 1,399 sq. ft. Maximum speed is said to be 248 mph. Range has been established at 2,730 miles and its service ceiling is 22,300 ft. Empty, the plane weighs 22,930 lbs.; loaded 36,380 lbs.

PLANE 7B—The Heinkel He 115K2, torpedo plane. The He 115 was one of the first torpedo planes tested by Heinkel engineers and adapted by the Germans. It is powered by two 880 hp. BMW 132Dc nine cylinder engines and develops a speed of over 200 mph. Service ceiling for this craft is said to be 21,320 feet. Although the craft is poorly armed in regards to machine guns for protective purposes (it carries only two machine guns, one forward and one aft), offensive armament is quite potent. Beneath the fuselage it carries a torpedo weighing 1,764 lbs. Wingspan is 75 ft. 10 in.; length, 57 ft.; height, 23 ft. 4 in.; wing area, 946 sq. ft. Empty, the ship weighs 11,670 lbs.; loaded 20,020 lbs.

PLANE 7C—The Kawanishi 91, reconnaissance bomber flying boat used by the Japanese Imperial Navy Air Arm. Powered by two 600 hp. engines, it is capable of non-stop flights over 2300 miles. Its only protection for warding off attackers are two machine gun pits; one on the hull nose, the other aft of the wing. It has a span of 77 ft. 7 in. Top speed is comparatively slow; only 132 mph.

THE DORNIER DO 217 E

Plans on Page at Left

THE Dornier Do 217E is a twin engine bomber adaptable to dive bombing, torpedo carrying, reconnaissance or precision bombing missions; it is powered by B.M.W. 801 14-cylinder twin row air-cooled engines each developing 1,600 h.p.

The bomb load capacity is maintained at about 6,630 lbs., of which 4,420 lbs. in bombs are carried internally, while two bombs of 1,105 lbs. each are mounted externally. Armament consists of four machine guns firing from the four place cockpit enclosure, and a 15 mm. cannon mounted to fire forward. The aircraft crew is fully protected by Armor plate.

For precision in dive bombing, the craft features an umbrella type brake which may be extended from the tail end of the ship. Increased cockpit visibility and perfect aerodynamic stability of the craft tend to make it a most formidable opponent. It was designed by Pressel, noted military aircraft designer. Late models of the 217 feature power-driven multi-gun turret on the top of the fuselage.

The craft measures 62 ft. 6 in. from tip to tip, is 56 ft. 6 in. long and has a wing area of some 620 square feet.

The Do 217 first appeared in England in January of this year, at which time much mystery surrounded the craft. Since then several were shot out of the skies and have been examined by British engineers who estimate that the craft is capable of at least 295 m.p.h. speed and has appreciable range.

VICTORY

SKY SCOUTS

Learn to spot enemy planes and help to defend America

LESSON 7

GREETINGS, Sky Scouts. Here is another installment of enemy plane silhouettes to test the keenness of your eyes.

A whole legion of Scouts has sprung up throughout the country; in innumerable places there are many groups of young sky scanners who are industriously making use of every moment to learn distinguishing marks of enemy aircraft.

Silver Sky Scout pins have already been sent to all those who have submitted two sets of correct answers for the silhouettes appearing monthly. Also cards have been sent to Scouts who are one of a group in any community. On these cards are listed the names of all other Scouts residing nearby, thus enabling them to form a Sky Scout unit. Each Scout can learn much more about enemy planes if he belongs to a group.

It is suggested that meetings be held to study distinctive features of the various ships; if desired, models can be made of these ships and hung up in the clubroom.

All Scouts must send in 12 correct sets of answers; one appearing each month, to become an Expert Sky Scout; then those qualifying will receive a gold Sky Scout pin. (A silver pin is sent to those who send in two correct sets.)

If you have not already joined this patriotic group do so now by studying the silhouettes and carefully reading their description, given here. Then write out the correct names of the various planes and send your answers to Sky Scouts, MODEL AIRPLANE NEWS, 551 Fifth Avenue, New York.

So that newcomers will be able to send in correct answers of all the previous installments, they will be republished from time to time. A complete set was published *(Continued on page 36)*

AIR YOUTH

(A Division of the National Aeronautic Association)

Official Model Airplane News Prepared by Al Lewis

Junior Air Reserve Organizing Throughout Nation

THE N.A.A. Air Youth program has advanced to the point of active organization of young aviation enthusiasts into Squadrons and Flights in a Junior Air Reserve. The first training directive has been mailed to hundreds of schools which have requested it, and the basic club pamphlet is being issued to hundreds of boys who want to form aviation clubs.

Patterned after the organization of the Civil Air Patrol, N.A.A.'s Junior Air Reserve will ultimately have a Wing Command in each state with subordinate Group Commands divided into Squadrons and Flights.

A Flight can be formed by five to fifteen boys who elect a Flight Leader and an Assistant Flight Leader. Each Flight must have a Flight Officer eighteen years old or over whose character and ability are vouched for by a major, school principal, N.A.A. chapter officer, airline representative, or other leading citizen.

As soon as a Flight is formed, its leader receives Training Bulletin No. 1, "First Lessons in Aviation." This booklet contains complete instructions for building a simple glider model designed to teach the fundamentals of flight and balance. A chart of airplane nomenclature is included with a demonstration lesson on "What Makes an Airplane Fly."

When a Flight is formed, all its members are classed as Cadets until they have completed the course set forth in the first training bulletin and are certified by their Flight Officer as having done so. Then they become Privates in the Junior Air Reserve and receive a second bulletin whereby they may advance on to higher ratings. All cadets must take this pledge:

Junior Air Reserve Oath: "Pledging my loyalty to the United States of America, I wish to train myself so that I may take part in the future of aviation and in any present duties which I may perform."

Two or more Flights can form a Squadron with a staff of officers as in the Civil Air Patrol. Thus the work of organization, training and operations will be divided among the members who can supplement their studies and aeromodeling practice with experience in taking responsible charge of specialized studies. The titles and nomenclature will follow military terminology to give the members a better understanding of the chain of command and the teamwork necessary for the conduct of large-scale operations.

While the N.A.A. Junior Air Reserve is wholly a private civilian undertaking, cooperation will be offered to federal, state and municipal authorities. The current program has been especially planned so that members can supplement their N.A.A. training courses with work on the scale models which the Army and Navy has requested to aid military and civilian defense forces in aircraft identification.

At first glance, the organization of the N.A.A. Junior Air Reserve may seem a bit complicated. But on brief study, like the entire set-up, it becomes extremely simple.

It is a vertical rather than a horizontal organization plan. The N.A.A. Academy of Model Aeronautics follows the horizontal plan, with hundreds of chapters and clubs all directly affiliated with the national headquarters. This plan is adequate as long as there are not too many units.

But when the number gets too large, it is impossible for headquarters to keep track of all of them. If a club disbands because all its members get aviation jobs—as often happens—headquarters is completely out of touch with activities in that area until new contact can be formed.

So Junior Air Reserve is planned to operate on the vertical principle with a chain of command from large units to smaller units, which in turn are broken down into still smaller units. Thus a network of organization is being created. If a Squadron becomes inactive, the Group Command can see to it that new recruits are brought in to carry on. If a Group Command is not functioning, the Squadrons below it and the Wing Command above can act to bring in new leaders.

J. A. R. Flights Forming Fast

Nine new Junior Air Reserve Flights have been certified by national headquarters, bringing the total number of states in which the Reserve is active to 22.

The second squadron has been established, and like the first is a product of the air-mindedness in the state of Pennsylvania. At Williamstown, Pa., under Squadron Leader Roberta Keiter, J. A. R. Flights Nos. 35 and 50 united to form Squadron No. 3-002.

The new Flights chartered are in five states as follows: Connecticut, Thomaston, Flight No. 52; Kansas, Hartford, Flight No. 57; also in Kansas, at Pratt, Flight No. 56; Michigan boasts four new Flights—No. 36 at Mt. Pleasant, and Nos. 53, 54 and 55 at St. Clair Shores (and that certainly sounds like good squadron timber!); New York State, on Long Island at Elmont, Flight No. 46; and at Williamstown, Pa. Flight No. 50 which is a part of Squadron 3-002.

Unprecedented enthusiasm has been displayed in Reserve activities by the aeromodeling press, and each of the airplane model magazines are arranging to carry extensive coverage of J. A. R. activities.

With the announcement of the publication of Training Bulletin No. 2, Washington headquarters has also distributed a series of five charts on flying, weather conditions and airline routes. These have been sent to the first 40 Flights and a subsequent mailing will carry the series to new Flights. Also distributed to all J.A.R. units was a copy of the first official J.A.R. "Military

(Continued on page 52)

Creed of the Junior Airman

By Gil Robb Wilson, President, National Aeronautic Association

I BELIEVE in aviation for myself, for my country and for humanity.

I believe the opportunities in aviation will offer me a career; the power of aviation will protect my nation; and the facilities of aviation will provide a way for better understanding among the people of the earth.

As evidence of my faith and to achieve these objectives, I pledge myself as a member of the Junior Air Reserve of the National Aeronautic Association of the United States of America to develop in myself the qualities which have been proven to be necessary to an airman.

JUDGMENT is the *first* requirement of the airman. I will think before I speak, and plan before I act.

KNOWLEDGE is the *second* requirement of the airman. I will be entrusted with the lives of others, so I shall feel a moral responsibility to know all that is within my power to learn.

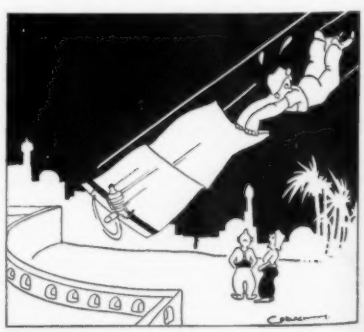
DISCIPLINE is the *third* requirement of the airman. I will develop in myself the ability to respond instantly to a proper order and to disdain excuses.

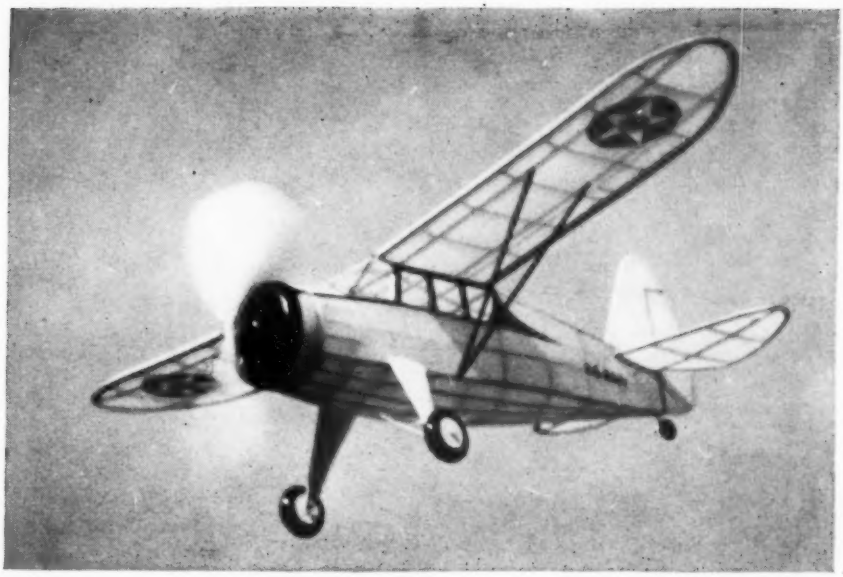
CONCENTRATION is the *fourth* requirement of the airman. I will practice self-control until I have learned to shut out fear, temper, indecision and carelessness.

COORDINATION is the *fifth* requirement of the airman. I will practice those exercises which teach my body to instantly obey the decisions of my mind.

HEALTH is the *sixth* requirement of the airman. I will seek to develop a sound mind in a tough body.

HUMILITY is the *seventh* requirement of the airman. I will keep an open mind, always eager to learn and to appreciate the experience of others.





MISTER MULLIGAN JOINS THE NAVY

A realistic high performance scale model of the new Navy Howard personnel transport plane

by EARL STAHL

WHILE the transport planes do not have the spectacular appeal of fighters, scouts and dive-bombers, they are a most necessary part of naval aviation. Essentially these "workhorses of the flying fleet" are adaptations of commercial ships, their mission being to provide aerial services of all kinds.

One of the latest type planes to be acquired by the U. S. Navy for light transport duty is the Howard GH-1. Ideally suited to this task, it has a convertible cabin for passengers, cargo, a stretcher for patients, space for mail or express, or for use in aerial photography.

Howard airplanes were developed from Ben Howard's famous racer "Mister Mulligan", winner of both the Thompson and Bendix Trophy races in 1935. Remarkably similar to the race plane prototype, Howard military and commercial transports are noted for their outstanding performance, ruggedness and ease with which they are flown.

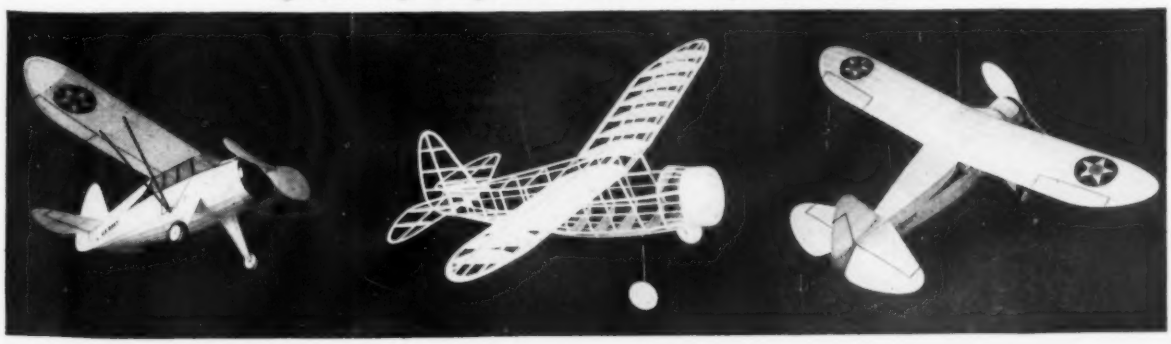
Few details have been released on the navy GH-1; however specifications of the commercial, five passenger Howard DGA-15P should prove fairly accurate. This 450 hp. Wasp Jr. equipped monoplane can cruise at 201 mph for 980 miles on 115 gallons of fuel. Initial rate of climb is nearly 2,000 ft. per min. and the service ceiling is 22,500 feet. Useful load is 1,700; gross weight 4,350 pounds.

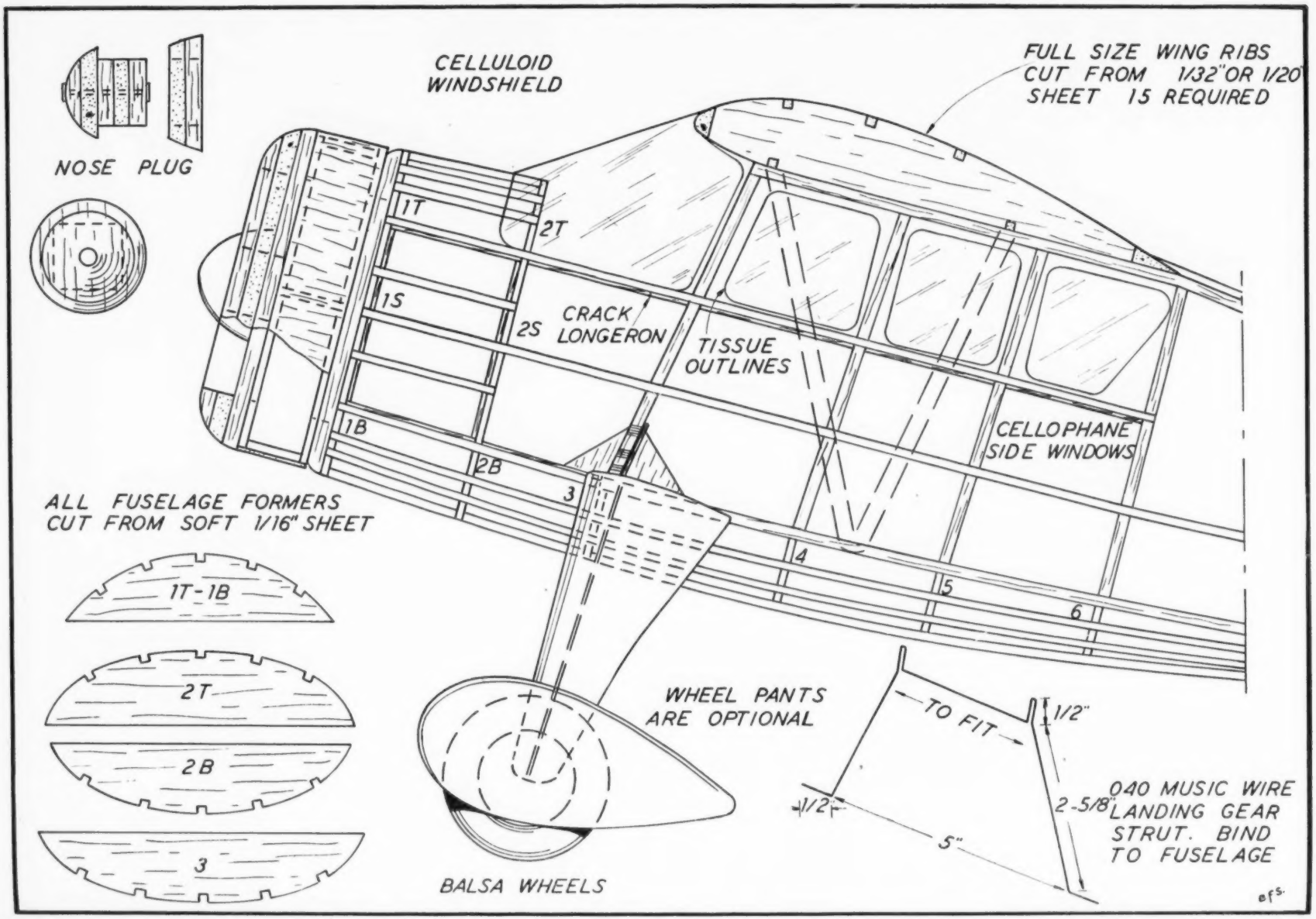
The model plans have been carefully prepared so they will serve either as the basis for a flying or scale model. Proportions of the real plane make possible an attractive model with exceptional flying characteristics. You are sure to be fully satisfied with the stable, swift flights of this little ship if you build it according to these instructions.

Construction: A simple rectangular frame is the backbone of fuselage structure; it is shown lightly shaded on the plans. Work directly over the plans, or better still, tracings, and build two side frames, one atop the other to be certain they are identical. While it is not absolutely necessary, it is best to steam or soak the longerons in hot water so they will dry to a natural curve and thus help in keeping the structure from springing out of shape. Hard grade wood is used and longerons and uprights are 3/32"

(Continued on page 41)

Designed carefully to scale for consistent stable flights while the frame is light but strong. In flight the resemblance to a large ship is startling.

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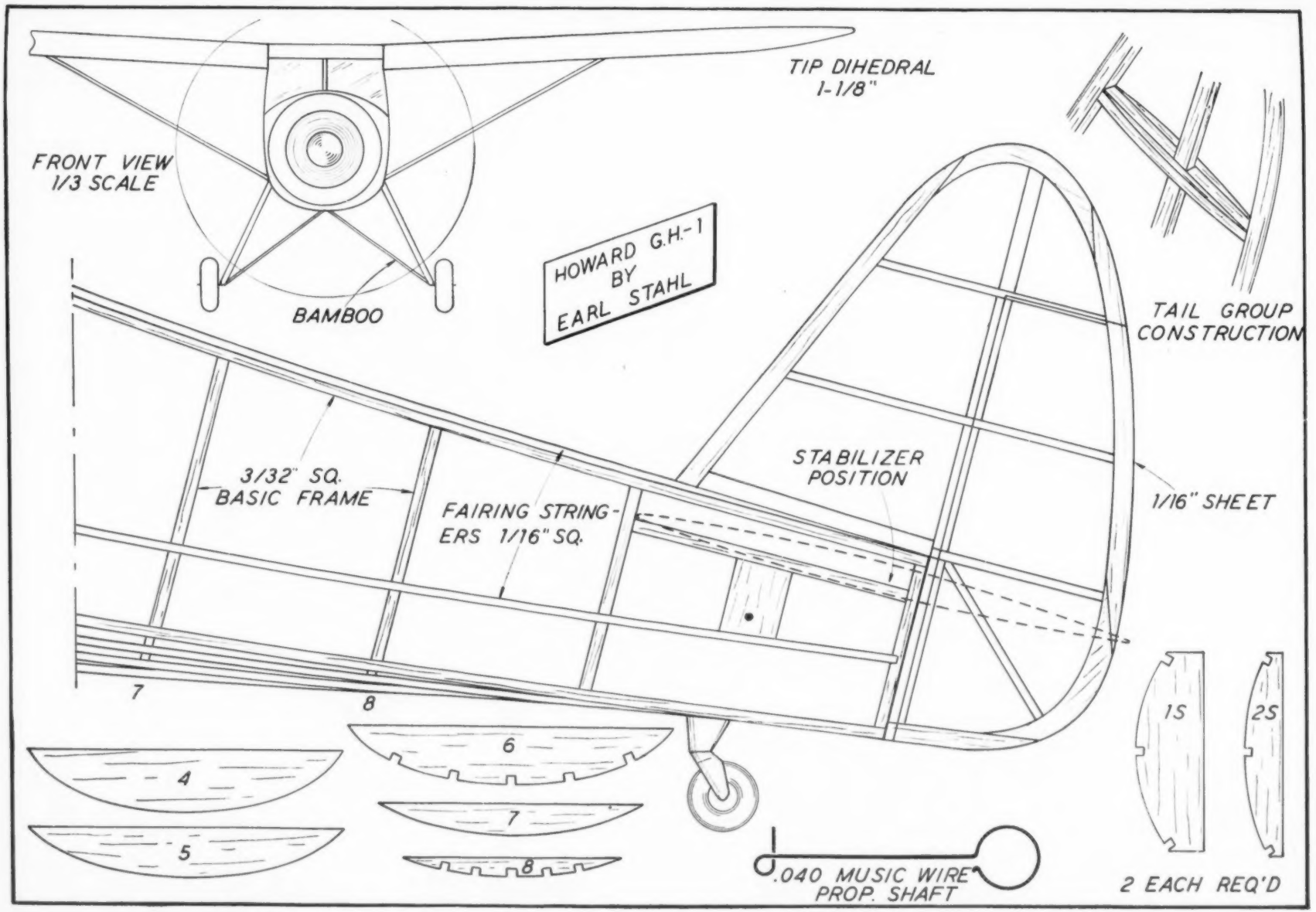
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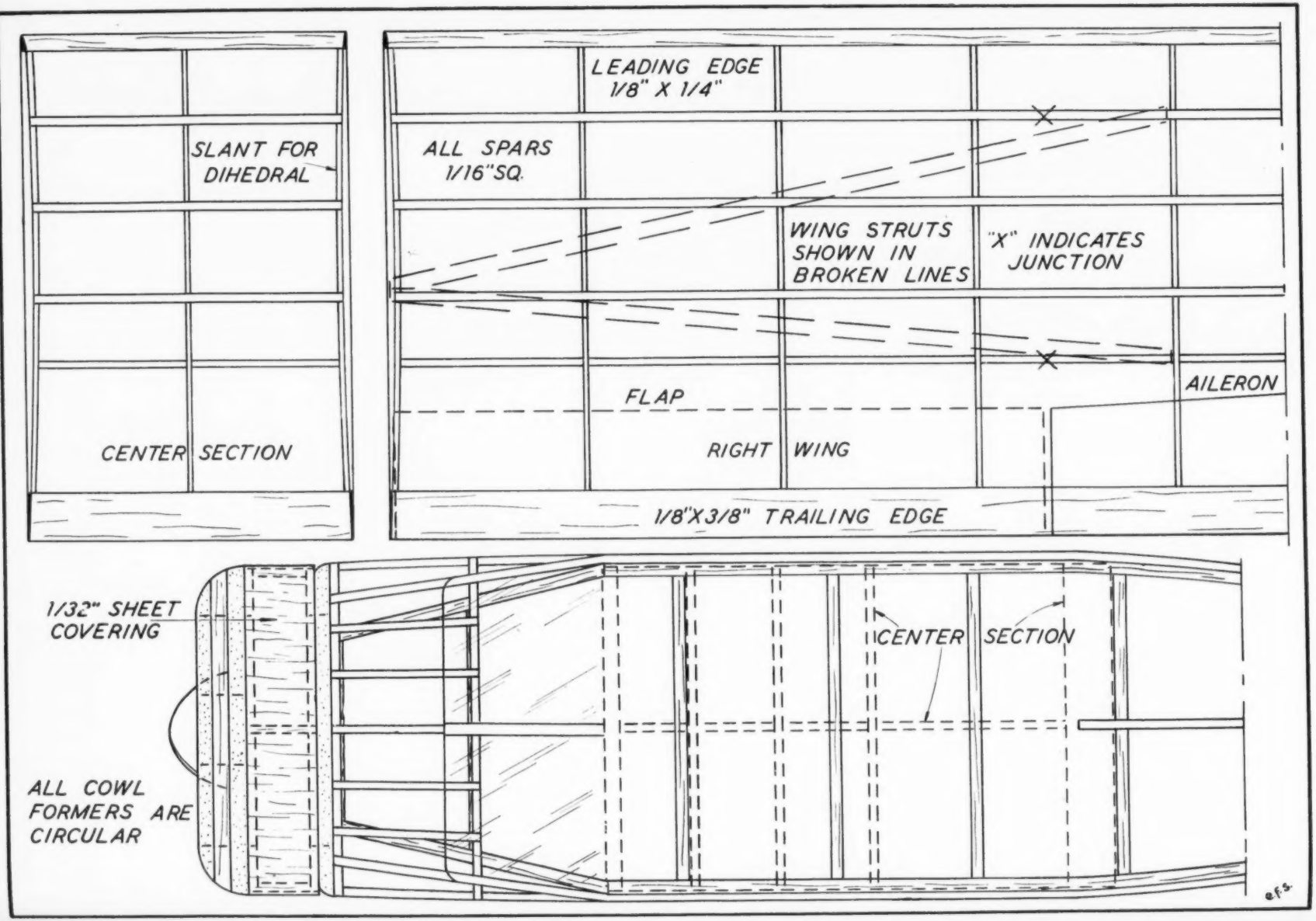
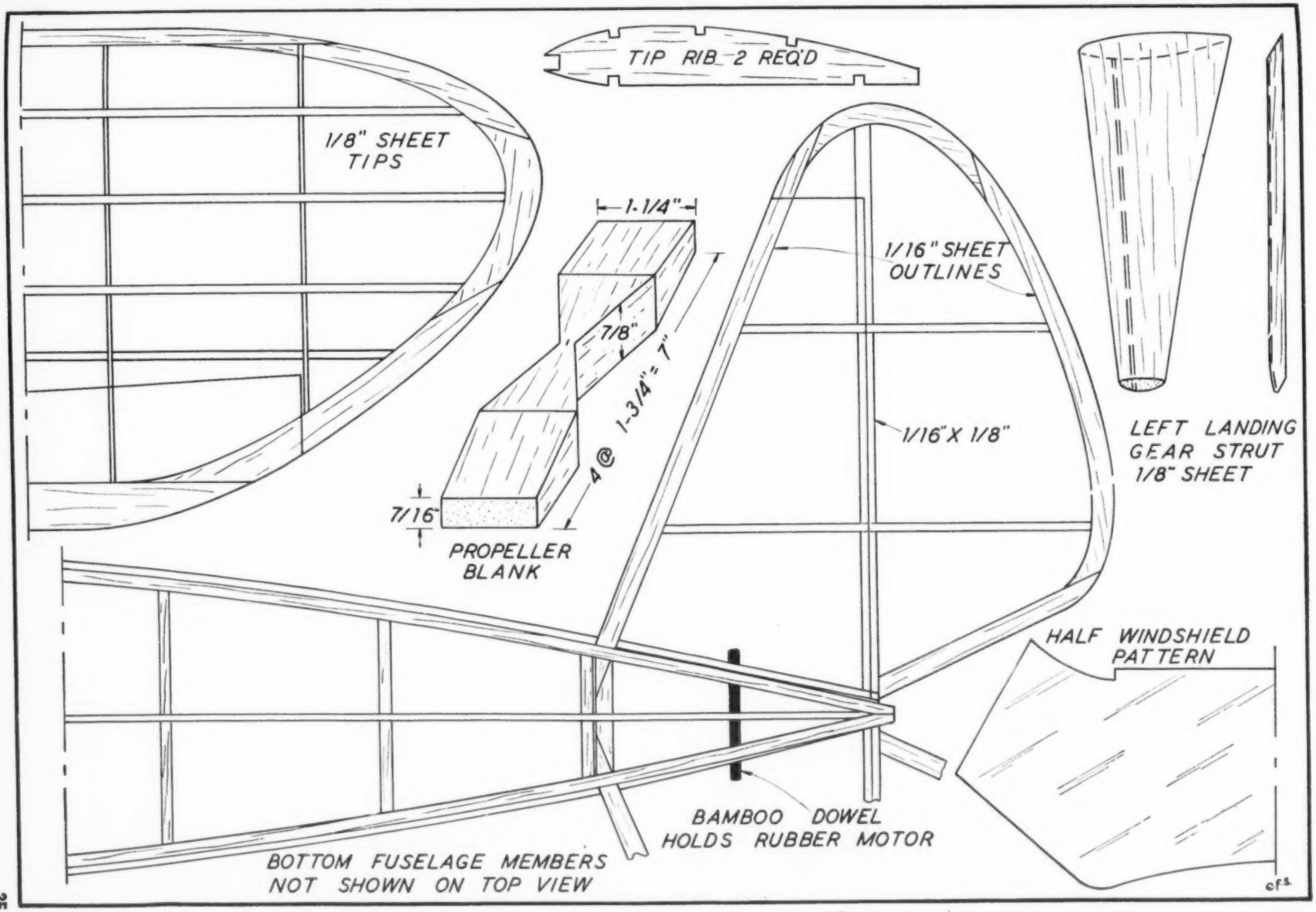
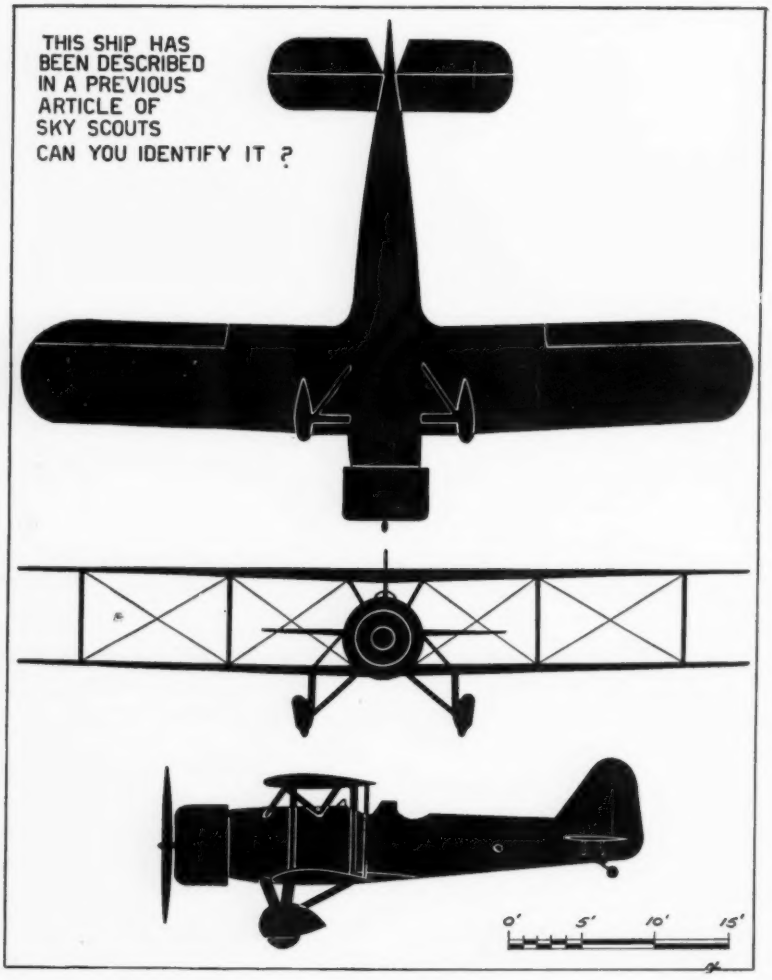

SLANT FOR DIHEDRAL
CENTER SECTION
LEADING EDGE 1/8" X 1/4"
ALL SPARS 1/16" SQ.
WING STRUTS SHOWN IN BROKEN LINES
"X" INDICATES JUNCTION
AILERON
FLAP
RIGHT WING
1/8"X3/8" TRAILING EDGE
1/32" SHEET COVERING
ALL COWL FORMERS ARE CIRCULAR
CENTER SECTION


TIP RIB 2 REQ'D
1/8" SHEET TIPS
1-1/4"
7/8"
4 @ 1-3/4" = 7"
7/16"
PROPELLER BLANK
1/16" SHEET OUTLINES
1/16" X 1/8"
LEFT LANDING GEAR STRUT 1/8" SHEET
HALF WINDSHIELD PATTERN
BAMBOO DOWEL HOLDS RUBBER MOTOR
BOTTOM FUSELAGE MEMBERS NOT SHOWN ON TOP VIEW



Sky Scouts

(*Continued from page 27*)

in the July issue; another complete set will be published in the October issue. Send in your answers to these back silhouette installments as soon as possible; you will receive your silver pin as soon as two sets of correct answers have been received from you.

When Scouts qualify by sending in 12 complete sets their names will be sent to their defense headquarters with explanation of their qualifications to serve as airplane spotters in their community. In this way young Americans can render vital service to their country.

The description of the silhouettes given with this lesson appear on page 27.

ANSWER TO SILHOUETTE

The plane shown in the 3-view silhouette here is the Kawanishi 96.

VICTORY

Send To: Model Airplane News, 551 Fifth Ave., New York, N. Y. 8

I Want to Become a Sky Scout!

Name .....

Address .....

City ..... **State** .....

The Physics of the Airplane

(Continued from page 17)

variation is introduced into a magnetic compass reading. This error will vary greatly with changes in position on the earth's surface. The variation is designated in amount as the angular displacement between a line drawn by the aerial navigator to either of the magnetic poles, and one drawn to either of the geographic poles. This of course is made with consideration for the location of the navigator. For instance, the magnetic variation of San Francisco is 18 degrees east. Certain limited areas on the surface of the earth are so located that their position with respect to that of the magnetic or the geographic poles is in a direct line with each of them. These points have no variation and are joined together on charts and maps by agonic lines. Points having equal variations are joined on maps by what are known as isogonic lines.

In making corrections, the navigator subtracts East variation from the true bearing to maintain the magnetic bearing, and conversely, adds West variation to the true bearing to obtain the magnetic bearing. To remember this process the student navigator might recall a childhood verse:

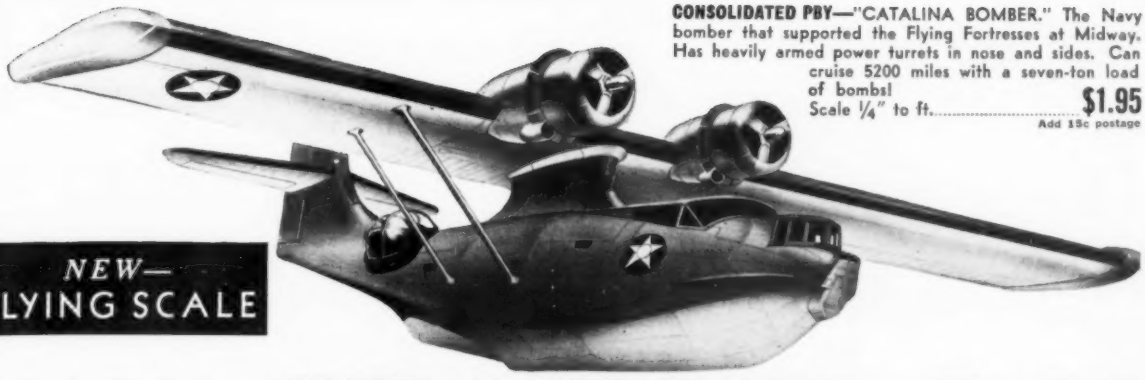
"East is least,
But west is best."

Deviation is the name given to another form of compass error, caused by the magnetic character of the airplane in which the compass is installed and emanating from the metallic structure, tools, engines and other equipment. Deviation error varies in all aircraft and on various headings. Deviation error, since it is subject to constant change, is compensated every few months in an airplane by "swinging the ship." This process consists in placing the airplane in normal flying position with the motor running at cruising r.p.m. on a circular concrete apron. This platform has the various magnetic headings laid off on its base. The airplane is then oriented toward the North, South, East and West, the deviation error being compensated as closely as possible by inserting small magnets in pockets provided in the compass case. Even closer compensation can then be effected by obtaining the deviation for each magnetic heading 10 degrees apart. The observed difference between the compass reading and the magnetic bearing is listed on a deviation card which is mounted above the compass on the instrument panel of the airplane.

Electrical and magnetic devices installed on aircraft fall into two general types. Electrical generators which provide the current for lighting and radio facilities, operation of the retractable landing gear, engine starters, and the other forms of auxiliary drives; and electrical spark-ignition devices which ignite the charge in the engine cylinders.

Both of the previously mentioned applications rely upon the principle of induced currents or electrical currents produced by moving magnets with respect to a coil of wire. First, we will investigate certain conventional electrical units, the study of which is a prerequisite for a clear knowledge of electrical ignition devices. The volt is the unit of electrical pressure. The unit of quantity is called the ampere. Every electrical conductor offers some opposition to the flow of electrical current. Therefore, each conductor exhibits some specific degree of resistance, varying of course with different conductors. The unit of resistance is called the ohm.

The relation between current, voltage and resistance is expressed in ohms, and by Ohm's Law, i. e., the electrical current in a conductor is equal to the electrical pressure or voltage divided by the electrical resistance. Expressed in symbols,



CONSOLIDATED PBY—"CATALINA BOMBER." The Navy bomber that supported the Flying Fortresses at Midway. Has heavily armed power turrets in nose and sides. Can cruise 5200 miles with a seven-ton load of bombs! Scale 1/4" to ft..... **$1.95**
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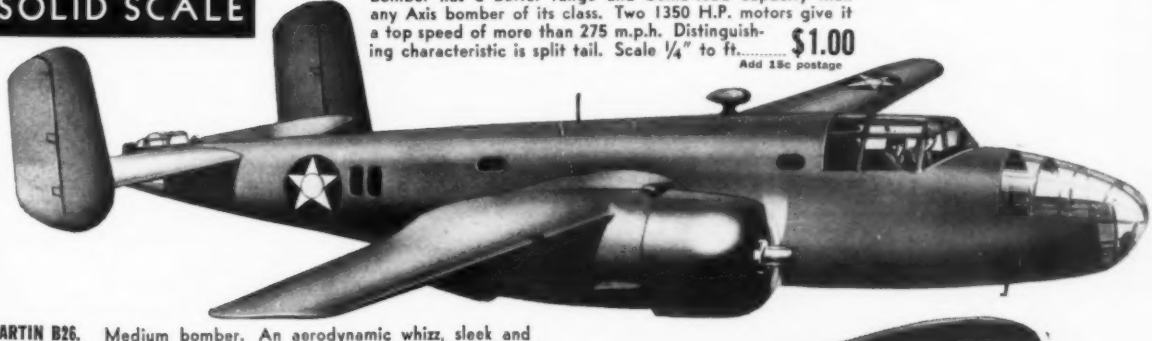

MARTIN B26. Medium bomber. An aerodynamic whizz, sleek and deadly. Two 1850 H.P. motors and four-bladed props drive it at more than 350 m.p.h., better than any known bomber speed. Range: 2000 miles with three tons of bombs. Scale 1/4" to ft.... **$1.00**
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this becomes the familiar equation $I = \frac{E}{R}$ where I represents the current in amperes, E the electrical potential or electromotive force in volts, while R represents the resistance in ohms. Voltage multiplied by the amperage equals watts, the unit of electrical power.

A very simple analogy can be derived between electricity and that of water, as far as the units defining the material characteristics are involved. As indicated in Fig. 1, the quantity of water stored in the upper tank represents the quantity and is synonomous with the electrical current or amperage. The weight of this column of water imparts a certain momentum to the flow of the water, this pressure as we may term it, being comparable with electrical pressure or voltage. Lastly, the resistance offered by the pipes to the flow of water through them has its electrical counterpart to the flow of electrical current through a wire, or ohms. See Fig. 2.

A direct application of Ohm's Law to aeronautics is found in the exhaust gas analyzer, standard equipment on practically all present day military and transport airplanes. This instrument makes use of the Wheatstone Bridge which, in turn, consists of two resistances, one known and the other unknown. These resistances are connected in a series circuit which also includes a battery as a source of electrical energy and a sensitive galvanometer.

To describe the electrical resistance type of exhaust gas analyzer, we must first consider that the ideal ratio of pure air to gasoline admitted to the float chamber of the engine carburetor is 16 to 1. This ratio gives the best attainable performance from the standpoint of fuel economy, but for greatest sustained power, the mixture should be slightly richer, having a ratio of 12 to 1, so a compromise is established at 14 to 1. Should the mixture be allowed to become richer, the power plant would not necessarily be damaged, but there would be a marked reduction in fuel economy. It is the lean mixture that must be guarded against since it causes excessively high engine temperatures and leads to violent predetonation, both of which are reflected by poor engine operation.

So the pilot may have an indication of these conditions before him at all times, the exhaust gas analyzer, or, more properly, the fuel-airmeter, has been developed. The device works on the elementary principle of electricity—that the resistance of a conductor increases as the temperature of the conductor material is raised. A potentiometer or Wheatstone Bridge, consisting of a series of four resistances across which is shunted a galvanometer (milliameter), constitutes the elementary structure of the device. Two of the resistances are fixed, a third is inserted in an air cell, the fourth inserted in a suitable exhaust cell. The entire circuit is connected to a storage battery. Should the resistances in all four branches of the electrical circuit balance, the indicator of the instrument reads zero. In operation with the engine running, the exhaust gas analyzer makes a record of the gaseous contents. The exhaust gases are run through suitable lengths of tubing in order to lower their temperature to 200 degrees. When the mixture is enriched, large quantities of hydrogen are generated. Now hydrogen has a thermal conductivity (ability to dissipate or transfer heat) approximately six times as great as that of pure air, so it is evident that the presence of this element in the gases quickly affects the sensitivity of the instrument. The resultant lowered temperature (the heat having been rapidly dissipated) decreases the resistance, this action being reflected in turn in a resultant high value of current. The pointer, as a result, is deflected to a higher graduation on the scale which is calibrated in terms of the fuel-air ratio. When the mixture is leaned out, the reverse of the previously mentioned action takes place. The unit described here can be included in a compact case suitable for mounting on the instrument panel of an airplane. It partially supplants a rather cumbersome device, in which the various constituents making up the exhaust gases were identified both qualitatively (from the aspect of both presence and amounts occurring) by means of chemical reagents.

When a coil of wire is rotated within a magnetic field created between the poles of a large electromagnet, an electromotive force is induced in the windings of the coil. The rotating coil device and the electromagnets are called a dynamo or generator according to definition. According to Lenz's Law, a rule much employed in the science of electricity, we can readily determine the direction of an induced current in a simple manner: Extend the thumb, forefinger, and middle finger of the right hand so that they are at right angles to each other. Let the thumb point in the direction in which the conductor is moving, and the forefinger in the direction of the magnetic field. Then the middle finger will point in the direction of the positive induced current.

Applying this "right hand rule" to the generator, we see, considering an elementary rectangular coil of wire as the conductor, that the induced current will have its direction of motion reversed every half revolution of the conductor. The current induced is thus termed an alternating current and attains its maximum value when the rotating coil is in its horizontal position, or lying in a flat plane with the poles of the electromagnets. This is true because the wire, moving at right angles to the line of magnetic force emanating from the magnetic field, is cutting these lines of force most rapidly when in the horizontal position, and the electrical output of the generator depends upon the number of lines of electromagnetic force cut per second. From this elementary reasoning, we can also see that the induced current will possess its minimum value when the coil is in the vertical position. In a fully equipped generator, brushes are provided. The mounting which maintain the brush in the axis of the revolving coil are termed collecting rings. These members rotate with the coils of the armature and function as the external circuit of an alternating current generator.

Aviation application calls for direct current for radio and ignition circuits.

In order to obtain a direct current, which is a uni-directional current that always flows in the same direction, rather than reversing its direction through the circuit twice each revolution of the armature, a direct current generator uses a divided ring or commutator, rather than two collecting rings. The same direction of current is maintained since the brushes of the direct current generator slip over the divisions between the segments constituting the commutator at the time that the electromotive force in the moving coil is at zero value. Thus, although the current in the revolving coils of the armature flows first in one direction, and then in the other, the current leaving the brushes of a direct current generator will flow through the external circuit always in the same direction.

Aircraft generators are of the series wound and shunt wound type, both of these types being self-excited, that is, the current for the field coils is supplied by the generator itself, rather than necessitating some outside source of exciting current. The former type derives its name because the field coils are connected in series with the external circuit, while in a shunt-wound machine they are connected in parallel or shunted across the main circuit. When the current supplied by the series-wound generator is increased, the voltage is also increased. On the other hand, when the current supplied by the shunt-wound generator is increased, a definite voltage drop occurs.

It is desirable to maintain a constant voltage for all loads since many electrical aircraft accessories function for a short time only and then are automatically cut out of the circuit, notably radio, electrically operated folding landing gears, etc. In order to attain this condition, the compound wound generator has been devised. This machine combines both type of windings, the two negative effects mentioned previously being neutralized.

Aircraft generators supply current for radio, lighting, heating, pumps, electrical instruments, and in a few isolated instances for aircraft engine ignition. Dynamometers used for testing the performance of aircraft engines consist of large electrical generators.

The electric motor is simply a generator reversed. The essential components which comprise the machine are the same in both instances. However, the electrical function is reversed and the machine is now being driven backward by an electrical current.

The efficiency of an electrical motor is the same as in any other machine, i. e.:

$$\frac{\text{OUTPUT}}{\text{INPUT}} = \frac{\text{INPUT LOSSES}}{\text{INPUT}}$$

A typical example is as follows:

An electric motor driving a de-icer pump delivers 15 amperes at 6 volts potential. Losses aggregate 13.5 watts. What is its efficiency? By formula:

$$\frac{\text{Input Losses}}{\text{Input}} = \frac{90 - 13.5}{90} = \frac{76.5}{90}$$

or 85 percent efficiency

One of the greatest applications of electricity and magnetism to the field of aeronautics lies in the ignition system of the power plant. The high tension ignition system is used in all aircraft gasoline internal combustion engines. The elementary assembly consists of two distinct circuits, a primary and a secondary as illustrated in Fig. 1. The source of current, a storage battery in our first case, is included in the primary circuit. The induction coil consists of a laminated iron core around which is wound two coils of wire not directly connected in any way except inductively through the intervening airspace. The current passes between the coils purely by induction. The primary winding of the induction coil is connected through the source of current to the interrupter or breaker points. The secondary winding, which has approximately 60 times more turns of wire than the primary winding, is connected to the spark plug, one end being grounded on the cylinder head of the engine. When the piston in the engine cylinder reaches 30 degrees before top dead center, the breaker points are forced apart by the action of a cam, causing a momentary cessation of primary current.

The breakdown of the primary current is further speeded up by the action of a fixed condenser which is inserted in the primary circuit. An induced electromotive force of very high voltage (about 30,000 volts potential) is induced in the secondary upon interruption of the primary current. This high tension voltage is transmitted to the spark plug by means of adequately insulated conductor cable. The electric arc, or spark, in jumping the gap across the spark plug electrodes, ignites the compressed combustible gases in the engine cylinder combustion chamber, their subsequent expansion upon ignition causing power which, in turn, forces the piston downward. See Fig. 3.

The condenser in the primary circuit performs still another function, it tends to prevent excessive arcing at the breaker points and possible damage to their delicate platinum-iridium surfaces.

An aircraft magneto is simply a high tension electrical generator and works similar in principle to the induction coil. While the induction coil has a battery excited circuit, the magneto is self-excited and the strength of the spark at the spark plug points depends on the strength of the residual magnets and the speed of rotation of the armature. The magnetic field is produced by permanent residual horseshoe magnets. On the armature is wound a few turns of primary winding and many turns of secondary winding. A circuit breaker here acts similar to the interrupter on a spark coil and a special

distributor functions to conduct the high tension secondary current to the spark plugs at timed intervals. The electrical phenomena to produce a spark is similar to the spark coil except that the entire action is self-contained and the current is generated entirely by the action of an armature revolving in a strong magnetic field. Without magnetos, high performance aircraft engines would be impossible because battery ignition has not proved as reliable and is heavy. A typical magneto circuit is shown in Fig. 4.

The subject of radio applied to aeronautics has vast ramifications which space does not permit us to discuss here except to mention that the generation of the electro-magnetic waves which constitute radio transmission and reception, all function in accordance with the basic and elementary science of electricity and magnetism.

VICTORY

Mister Mulligan Joins the Navy

(Continued from page 29)

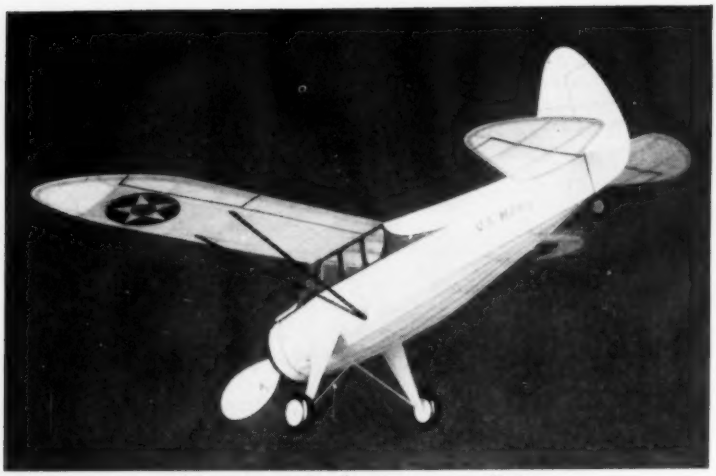
sq. stock. Invert the completed sides over the top view and cement 3/32" sq. pieces to place at the center of the body; when dry, draw the backs together and place the remaining cross-pieces. It will be necessary to crack the longerons in the front so they can be pulled into the positions shown on the plan.

Cut the various formers from 1/16" sheet and now if the basic structure is dry, it should be removed from the work board and formers attached to their correct positions. Center section is assembled and cemented to the fuselage frame; do this accurately as the wing's correct placement is determined by its position. Since stringers are merely fairing strips, they should be medium-soft balsa. Stringers are cemented directly to the underframe except where there are formers, of course, and where there are no notches in the formers; they are cemented right to the sides.

The engine cowling is made next. A frame consisting of two circular 1/16" sheet bulkheads and four 1/16" sq. spacers is assembled as indicated by broken lines; this structure is covered with 1/32" sheet. The rounded nose section is made from laminations of 1/8" sheet; the centers of these discs being removed to the extent shown. Details of the nose plug are indicated. The removable section should be made to fit accurately to the crankcase which is cemented within the cowl front. Finish the nose and cowl by sanding to finished shape but do not cement the cowl to the nose until later.

The landing gear unit can be made at this time; it is bent from .040 music wire and formed to shape and size shown. Using thread bind the wire unit to the fuselage underframe. Add the triangular 1/16" sheet gussets shown and then apply several coats of cement. Although the 1/8" sheet balsa struts are not added to the landing gear at this stage of construction, they can be cut out. These struts are streamline in crossection and have a groove in the back to conceal the wire.

Pieces of hard 1/16" sheet cemented



Not only a stable flier but most realistic

between the rear fuselage members provide anchorage for the bamboo pin that holds the rubber motor in the rear.

Only the right wing plan is shown so it will be best to prepare a full scale drawing of the left panel in order that construction can be done directly atop it. Using patterns given, cut the regular and tip ribs from 1/32" or 1/20" sheet. Pin all like ribs together and sand them uniformly, then very accurately cut the notches. Pieces for the tips are cut from 1/8" thick sheet and assembled over the plan. Taper the 1/8" x 3/8" trailing edges before pinning to place over the drawings. Ribs are kept in proper alignment by pins. Spars are hard balsa strips, all of them being 1/16" sq.; leading edge is 1/8" x 1/4". Slant the inner ribs a bit so the dihedral angle will be correct. Cement all joints firmly, then when dry, remove from the plans and finish the edges and tips by trimming with a razor and sandpapering.

Making the tail surfaces is easy and both the rudder and stabilizer are constructed in a similar manner. In the interest of greatest strength the stabilizer is built in one piece so a complete plan must be drawn. Outlines of the surfaces are cut from hard 1/16" sheet stock and spars are 1/16" x 1/8" strips. Ribs are lengths of 1/16" sq. When dry, frames are removed from the plans and soft pieces of 1/16" sq. cemented to each side of the ribs; these are cut streamline once the cement has hardened. Trim and sand the surfaces to their final shape.

Shown in perspective is the propeller blank. Select a hard block of the proper size and then shape the blank as indicated. Drill the tiny hole for the prop shaft before starting to carve a right-hand propeller. Hardness of the block will determine the blade's thickness, the shape of which can be seen in the photos. Thoroughly sand the propeller to balance and smooth the blades, then apply several coats of light dope with light sanding between each to produce a nice finish. Equip the air screw with a free-wheel device of some sort to help improve the glide. A washer is cemented to the back, too.

For the propeller shaft use .040 music wire. Fix the thrust line through the nose plug by cementing washers to both sides then slip the nose plug, several washers, and propeller on the shaft in the order given. A loop is bent in the end of the shaft into which a winder can be hooked.

Covering and Assembly: Probably the most important item for a fine appearing model is a neat covering job. Before starting to cover your Howard, the entire frame should be lightly but thoroughly sanded to remove all roughness. The flat side windows are covered with thin cellophane at this time; the front windshield is celluloid and is not added 'til later. Either colored tissue or light grade Silkspan may be used—color of the real plane is silver but other colors to suit the builder may be employed. Cover the fuselage first using light dope or banana oil for adhesive. On curved parts numerous small pieces of covering will be required to prevent unsightly wrinkles. Use an individual piece to cover each side of each wing and tail section. The balsa cowling and similar parts are tissue covered too. Once covered, all parts are lightly sprayed with water to tighten the covering; to keep the wings and tail surfaces from warping they should be pinned to a flat surface until dry. Clear dope is not applied until later.

Next the various parts are assembled. A half windshield pattern is given. It is best to make a complete paper pattern to check for exact fit before cutting one from celluloid. Avoid cement smears when attaching the windshield.

Completion of the landing gear unit is easy. Flow cement into the groove of the previously made fairing struts and fit them over the wires—do not, however, attach the tops of the struts to the fuselage structure. A strip of silk cloth over the strut and wire will keep it from coming loose. Colored tissue should be doped to the struts so they will match the fuselage. Wheels are made from laminated sheet balsa or they may be purchased. Wheel pants improve the appearance but since they are optional equipment on these planes, we eliminated them in the interest of lighter weight and better flights. Color the wheels and then attach them to the axles by soldering a small washer to the ends. The thin

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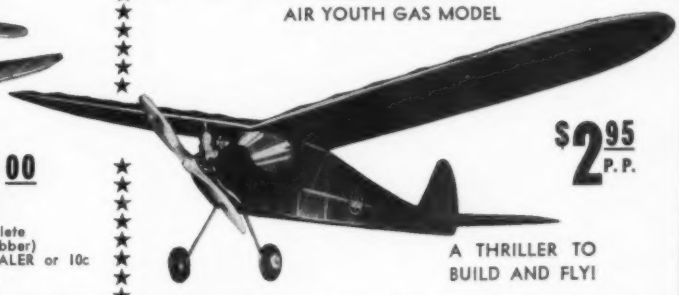

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center struts are rounded pieces of bamboo.

Care must be exercised when assembling the surfaces to the fuselage. It will be necessary to temporarily cut the rear of the fuselage to get the stabilizer in place; it is parallel to the work bench. A tissue fillet is fitted between stabilizer and body before the rudder is set in position. Off-set the rudder a bit for right circle in the glide. Tips of the wings are raised 1-1/8" for proper flight stability; be sure they are cemented securely. Wing struts 1/16" deep are shown and they should be assembled and painted before being attached. The entire model is given one or two coats of clear dope.

Add the various more minor details to "dress-up" your Howard and the construction is finishd. Naval insignia, cabin trim, cowl decorations, etc. are all made from colored tissue of a contrasting shade. Control surfaces, a door and the like are effectively represented by thin strips of black tissue. If the builder wishes, engine details can be placed within the cowling. The tail wheel and similar items are made from scraps of balsa. Naturally the propeller and similarly exposed wood parts should be colored to match the model's color scheme.

Flying: About six strands (three loops) of 1/8" flat brown rubber will be required to power the little ship. Measure the strands to right length and then attach them to the loop on the prop shaft. Drop the other ends through the nose and slip the rounded bamboo pin through the fuselage to attach them. It may be necessary to remove a small section of covering to do this. Your Howard naval transport is now ready for its first flights.

To get maximum flight performance from any model, it must be properly adjusted. Even the most carefully built planes usually require some minor corrections so go about this with caution. Before going to the flying field, the ship should be made to balance on an even keel when held at the wing tips; this is done by adding weight to the nose or tail. A grassy field free from obstructions is best for flying this or any other model. Test glide and make any weight readjustments necessary to get a nice, smooth descent. Once the glide is satisfactory, try short power flights and if any corrections are needed, make them at the nose plug by offsetting the thrust line. A sliver of wood between the top of the nose plug and crankcase, tilting the thrust line down, will probably "iron out" a stall while right or left thrust will make it circle as desired while under power. Under power circles should be large and to the left; in the glide it should turn to the right.

The original model is pleasing to the eye from the standpoint of appearance and it is an unusually capable flyer. It makes a picture when on display or in flight and is sure to please the most exacting fan.

VICTORY

Air Ways

(*Continued from page* 23)

air force or in the air industry, making excellent, patriotic use of the knowledge acquired through their model activities.

Peter Bowers hasn't given up models entirely—no modeler ever does. In odd moments he finds time to build one or two new ships; picture 2 shows his latest. He says:

"I am one of those stubborn guys who believes that a model airplane should look something like a real ship and not a flying spider. Furthermore, I am convinced that a cabin job, properly designed, can still hold its own with the pylon jobs in a contest, besides providing more satisfaction for the builder."

We emphatically agree with Bowers, and his contention has been proved on a number of occasions. The plane shown is 6 1/2 ft. in span with semi-gull wings. Note that the nose is short, helping to make it a successful contest ship. It sports a monocoque type fuselage and a carefully cowled engine. Streamlining has been carried out to a high degree, including a large prop spinner. The wings are a single box-spar type, silk covered. Total weight is 2 3/4 lbs., with a wing area of 5 sq. ft. providing a wing loading of slightly under 9 oz. per sq. ft.

One of the first large contests of the season was held at Moorestown, New Jersey, on May 17th, sponsored by our old and good friend, Mr. E. Angus. Moorestown is about 10 miles from Camden. Approximately 150 modelers attended, including the first all-girl squadron of the Junior Air Reserve—leader, Mrs. Jordan and members, the Jordanettes. Flights and ships indicated that the modelers had lost none of their technique during the winter months. Some of the well-known modelers and ships that participated were:

Everett Powers, scale Fokker; Stanton Hubbard, original U-control; Russell Simmons scale P-39, U-control; Leon Shulman, original G-line; Art Gray, Mantua U-control; Bill Mott, 3 original designs; John O'Brien, class A stick Tomahawk.

A new and very interesting event was held at this contest, namely a tether plane contest. Due to the necessity for restricting flights, these are becoming more popular.

Although this was not a hydro contest, one of the most interesting planes was Bob Shepard's hydro boat, shown in picture just after being test launched. Great interest was shown in its unusual features evidenced in the photo; one being its unusually large stabilizer which was largely responsible for its steady flight.

An uncommon tether ship (shown in four photos at bottom of pages 22 and 23) was built by Art Gray and is a U-control model of the much-discussed full scale Mantua pursuit designed by Jack Northrop. It flies under all conditions and was one of the most maneuverable tether ships at the meet. Though little dihedral is used it is unusually stable; this unquestionably

is due to the plane form of the wing.

In the photos Art appears at the controls of his plane which is leading for a takeoff on the runway; after warming up the motor for a few seconds it is shown taking the air with a rush of power, tearing along at about 60 mph. In another shot it has gained altitude, much like lightning at the end of a string. Finally, Art is shown watching careful because the control is delicate at high speed.

One of the excellent designs and most efficient models ever created is shown in picture 9 with its builder, Harry Apoyan, who spent two months in designing and building it. You will note the clean lines, gull wings and slightly upturned wing tips which are most efficient. A stabilizer of unique design is also used; this rests on a pylon to keep it free from the wing wash and to provide fin area below; upturned tips also give a fin effect. There are no protrusions; even the propeller blades fold back and the landing gear retracts. The performance of this ship is phenomenal; it fairly slides through the air while the large stabilizer provides plenty of stability.

Another unusual tether model at this contest is shown with its builder, Leon Shulman, in picture 8. This ship went on a rampage—it was so fast that the strong tether string broke and the model escaped. Finding itself free it immediately nosed skyward, climbing at about 45 degrees high into the blue—then without warning, it quickly swung around, at 360 degrees, and came straight back to earth again, tore into the ground, at well over 60 mph. Its builder expected to sweep up the pieces but, strange to say, the only thing that was broke was the propeller and the fuselage; the latter only slightly. The model now is repaired and—behaving.

Picture 3 shows an Interstate Cadet rubber powered model built by Tony Mazzeo of 1223 Ferry St., Easton, Pa., from plans in MODEL AIRPLANE NEWS. It is equipped with a free-wheel propeller which is partly responsible for some excellent flights and for the ship's exceptionally flat glide. The picture is not posed but shows the ship during actual flight. Mr. Mazzeo is an M.A.N. veteran having read this magazine continuously since 1932.

In mose contests, builders emphasize design characteristics that give flat glide, high climb and low drag. However, though these qualities are inherent in a ship, on many occasions it is impossible for these characteristics to prevail during flight because builders have consistently overlooked the fact that only when a model is stable and files under the conditions assumed by the designer will it operate as expected.

A wing climbs best at from 5 to 8 degrees, and when designing a wing to do this it is necessary also to build sufficient stability and steadiness into the ship so that this angle of attack will be constant through all periods of flight. If a ship climbs erratically—at varying angles—stalls and then loses altitude, using up valuable power to regain it, all efficiency factors included in the plane are of little value. Consistent flight qualities must be built into the plane, as well as efficient qualities, and it is better to sacrifice some efficiency for consistency.

A ship of this type is the one shown in picture 4, built by H. B. Wells of 1344 Harvard St. NW, Washington, D.C. So far it has made a total of 120 flights, the longest 36 min. 45 sec. We congratulate Mr. Wells on what we believe is the right approach to duration flying!

One of the big meets of the West Coast is the Bakersfield, Cal., annual contest which took place, smooth and successful, on Sunday, April 12th. Bill Council of 3285 Harvey Avenue, Fresno, Cal., sends a complete, detailed report:

"The field on Kern River bluffs eight miles east of the city was thronged with some 200 contestants to vie for the two hundred dollars in cash prizes, many trophies and an ample supply of merchandise prizes. The contest was sanctioned by and held under the rules of the Academy of Model Aeronautics.

"Leroy L. Langston of Venice won the grand prize with a big class C plane; his three flights totaling 47 min. 34.5 sec. Other winners in this class were Bob White of Pasadena, 44:14.8; P. C. Oldershaw, Bakersfield, 40:5.4; Ray Acord, Hollywood, 25:36.2; Dutch Van Tassel, Fresno, 19:19.2.

"Class B winners were G. Crossman, San Francisco, 45:24; Ralph Conn, 34:35.4; Ralph Linhoff, 30:11.8; John Stenderup, 19:1.7; Joe Mickoll, 11:1.8.

"Class A winners were W. H. Winter, Fresno, 17:21.7; Bob Hanford, 15:58; John Stenderup, 15:11.2; Vernon Oldershaw, Bakersfield, 13:40.8; Roy Gruenwald, Fresno, 11:34.4.

"Officials were Ray Wood, contest director; E. P. Van Leuven, field judge and Wiley Chapman, head timer.

"If anyone doubted the enthusiasm of these California modelers they need only to

have wandered through that crowd Sunday morning and chatted a bit here and there. Yeah, sure most of them were weary from lack of sleep—why not?—when everyone had labored far into Sunday morning putting the last delicate touches to a sure-to-win plane. In fact, many failed to get into bed at all. Rather, after the final adjustment to that hottest motor, they piled into cars and started the long trek. From Vallejo on the north to Ontario on the south, they were there. And despite weariness, all met a handshake with a grin of confidence.

"First swing around the roped-off circle I met a friendly bunch of fellows from the Pasadena Barnstormer's club. Albert Barnard, as spokesman, introduced Bob White, Bob Swain and a number of the others. As the day passed these boys were to show some nice flying and a fine sportsmanship. Incidentally, Bob White had the tough luck to lose a model in an unofficial flight. Just a little farther on, and just as friendly, were Bob Polson, Ralph Beebe and Jack Meinecke from Vallejo. Nearby was a group of fellows from the Los Angeles Club, quietly grooming their planes. And so on. Everywhere you went you met that same spirit of friendliness.

"Needless to say, even before the contest was under way there were heart-breaks galore. Imagine, if you can, the feelings of a modeler who has labored until four a.m. only to have his plane crash into a dozen or more pieces on the very first test flight. But what the heck? Why tell any of you guys about that? You've all had that experience.

"I kept a pretty close eye on the Fresno gang throughout the day, possibly that is because I have been getting by with ribbing them for a long time without serious consequence. Be that as it may, it is evident that Joe Menezes of that club should be a claimant to a record of some sort. Joe cracked up three top-notch ships during the course of the contest. In fact, it appeared that the Fresno bunch must have left their rabbit's foot at home. Possibly, only the fact that Red James wore his lucky hat allowed Bill Winter to win first place money in Class A and a few of the other fellows to draw some of the merchandise prizes. Incidentally, Mrs. James says that that hat, which Red wears in every contest, is the Easter bonnet she failed to get. Confidentially, there must be a story connected with that picturesque head-gear.

"Thermals were plentiful all during the contest, but late in the day they became very tricky. Four thousand spectators gazed in amazement at the antics of a beautiful plane belonging to Hal Lee of Colton. Nobody seemed to know exactly what kind of a wind caught it at about a hundred feet, but it was wicked. As the motor cut, the ship began a series of crazy shiverings and weavings. A few moments of this and the wings were torn completely from the ship and the motors plummeted. The playful thermal held the wings aloft for many moments longer, twirling and tossing them like a toy. Then, apparently tiring of the fun, the wind dumped the wings just as suddenly as it had caught them.

"However, a good time was had by all!"

In picture 10 you see a few of the contestants taking time out from the preparation of their planes to watch a thrilling test flight. Easteners will look with longing at the fine flat and extensive flying field.

The U.S. Navy Solid Scale Modelbuilding Program is progressing satisfactorily; great interest has been shown by modelers all over the country and it is drawing many new, younger builders into the field—this partly was its purpose. In picture 12 you see a group of young builders of the Kip's Bay Club in New York City. Reino Ahlberg and Jack Mussilino are instructing the young birdmen in turning out their quota of ships. The quota for New York City is 35,000, and for the State 60,000; Connecticut youngsters are expected to produce 7,000; Alaska 100; Hawaii 2,000, and so on.

Recently 2500 models were turned out in one batch by the Los Angeles, Cal., schoolboys; these have already been given to the proper government officials.

Jack Gantz of 1321 N. Kingsley Dr., Hollywood, Cal., exhibits some excellent work in his detail scale Curtiss P-40, shown in picture 11. It is finished in green and brown camouflage, has complete cockpit details, and required one month to build. Note that it is decorated similarly to the planes being used in the Libyan desert by the British.

Picture 5 shows what can be done to make a high performance gas job look like a real airplane. Its builder, R. P. Anderson of 185 Margaret St., South Portland, Maine, has designed it with characteristics of an Army observation plane. He says that the details do not add to the weight appreciably but contribute to the appearance of the ship. It has a span of 52 1/2", chord of 8", and length of 30". The cabin is finished with instrument panels, carved pilot, etc., and the coloring is the wartime Navy scheme of carrier-based ships.

One of the unique features is the wing slots. Anderson says it is not the first time he has incorporated them in planes; last summer he built one with slots which worked wonders. On both ships, slots seemed to smooth out the glide considerably though they were only 8" long. He would like to hear from anyone else who has had experience with slots, and says: "I believe they are tops, at least for use on semi-scale and scale models."

Corporal William R. McNeil of the Ellington Field, Texas, photo department, spends his spare time building scale models of American and enemy planes for use in aircraft identification classes for student bombardiers and navigators. Corp. McNeil's home is in Barbourville, Ky., where he taught school before joining the Air Force. The ship he is working on in picture 7 is a P-39; the partially completed model on the bench before him is a B-26. Model builders all over the country are turning their skills to building the scale

identification models.

Illinois

We hear from Charles J. Hein of 1106 Rose Avenue:

"This is to let you know that there is a model airplane club in Des Plaines, known as the Skywolves. We have 20 members and are mainly interested in gas powered models in tethered and A,B,C free flight.

"We are ready for competition either by mail or in the field. Clubs within a reasonable distance from Chicago who care to compete in the field, or clubs in distant cities who would like to hold a contest by mail, kindly write to me, giving their propositions and we will be glad to reply.

"Contest schedules of other clubs would be most welcome."

Canada

Walter Roland Allen of 5709 Brissette St., Cote, St. Paul, Quebec, writes a very detailed report of model activities which will prove of interest to our readers:

"For the past four or five years Montreal model building has been carried on solely by individual enthusiasm. However, we have lately banded together to form the Montreal Model Flying Club. Our membership is composed entirely of our city's best builders. Among these are such fellows as Ben Tarnofsky, Claude Hill, Dave Rosenberg, Stan Cole and many others. Jack Blumer regularly turns in flights of four minutes or more. Dave Rosenberg holds the indoor semi-scale record of 3:14 with a Bleriot. Claude Hill is our Canadian National Gas Champ in Class C; a while back he did eight minutes on a ten second motor run. When his ship landed it hit a cow; then things began to happen. Cliff Greaves' ship last summer flew from Cartierville to Granby. That is, after it passed over Granby it was not reported. Cliff lost his Ohlsson 23 powered model two weeks ago, when he last saw it it was high over the St. Lawrence River. Dave Rosenberg's plane turned in a six hour flight last summer as well—we can produce witnesses for that one. Marshall Green's Adrock put up a similar performance.

"Lately we have had a bit of trouble in procuring supplies for our ships. We were also politely 'kicked off' a few of our limited supply of flying fields. At present we are flying in a field in the Town of Mount Royal. Some fellows have been known to fly a gas job using lighter fluid instead of gas for fuel. Balsa supplies are short; often one will hunt for two or three days before getting a decent wing spar.

"We have had a number of club contests here and in Ottawa. The Ottawa fellows have organized into a compact little group which turns in beautiful flights. Last September they invited us up to their home town and we responded in force. Forty-two of us arrived there Sunday morning at eleven o'clock. In turn, we invited them to come down here. This Sunday we intend to go to Brockville for an intercity contest between Ottawa, Montreal and Brockville. We hope we will have a decent day for flying. I have just received drastic news over the telephone: unless there is a sufficient

number of ships promised, there will be no Eaton's contest this year. If any fellows in the States were thinking of coming up for that time they would be rendering us a great service if they would send the T. Eaton Co. a letter informing the company of their intentions; it might help the Co. to make up their minds to have it. The company has asked us to gather a number of fellows who would promise to have a ship out there on the day. The Nationals will not be held at all this year. There will be no exhibition held in Toronto as the Government has asked to have all such events cancelled and may put a ban on all travel of over 100 miles. We hoped for a while that the T. Eaton Co. might sponsor it. Now even that hope seems doomed.

"At our club meetings we have had a number of interesting speakers as guests. Mr. Lymburner of Fairchild Aircraft gave us an interesting talk on flying in the Polar regions, demonstrated by movies which he took on the Lincoln Ellsworth Expedition. Mr. Caprsol of Noorduyn gave us a talk on the flying and testing of military ships. He also sent us some dope and gasoline. In the future we hope to have more such interesting lectures.

"Well, until some more news comes along, so long."

CANCELLED CONTESTS

Pennsylvania

The Allentown Gas Model Association, 22 N. 8 Street, has found it necessary to cancel the Pennsylvania State Exchange Club meet. If at all possible, an Exchange Club meet will be run later on.

Another contest which regrettably has to be cancelled is the Scripps-Howard Junior National Air Races, originally scheduled in Pittsburgh, Pa., on Sept. 5, 6 and 7. This is one of the nation's oldest model meets. It is intended that the postponement will last only for the "duration."

VICTORY

Fly the Streak to Victory

(Continued from page 19)

against wear from the 3/16" diameter pine dowel in the rear. The wheels are made by laminating two pieces of 1/4" balsa sheet, cross grain. One-quarter inch washers are placed on both sides of the wheel at the hub.

Wing—In constructing the wing, first make a wing rib template from the full size drawing and cut out 36 ribs plus 2 tip ribs. The wing is made in two halves, the two center ribs being slanted to take the center dihedral, while the center spar is cut as shown on the plans to form the tip dihedral. The leading edge is shaped to fit the front of the rib by means of a template. The trailing edge is cut in standard triangular shape. The centermost part of each wing half is built first, then it is raised by blocks until the outer tip section is flat on the table and it is constructed. The front and rear spars are cracked for tip dihedral.

Be sure to glue well and also to add the gussets shown, and the wing will be of desired strength. The wing tips are now added and sanded to a tapered shape in line with the gradual taper at the tip. The entire wing frame is sanded to eliminate bumps in the covering where the ribs meet the spars. The two wing halves are glued together before covering and a 1/32" sheet balsa covering is added at the center along the leading edge as shown on the plans. The wing is propped up with balsa blocks to hold in the dihedral while drying.

Tail—The stabilizer is constructed similarly to the wing with the exception that no dihedral is used, thus allowing complete construction on a flat surface.

The rudder is made flat, using a 1/8" sheet balsa outline with 1/8" square balsa spar and 1/16" x 1/8" balsa ribs. When dry remove from the working surface and glue 1/16" square balsa strips on either side and over the ribs. These are trimmed down to the airfoil shape as shown on the plans. The sub rudder is made by laminating two 1/16" sheet pieces cross grain. A small strip of thin aluminum is added to the point of contact with the ground to prevent wear.

Covering—Begin covering by first placing the celluloid on the windows. Then cover the rest of the body with rubber model silkspan, also covering over the sheet balsa on the nose and the balsa fairing on the landing gear. The rudder is also covered with silkspan.

The wing and tail are next covered, this time with ordinary tissue. Be sure to stick the tissue to each rib on the undersurface of the wing to hold the desired airfoil shape. When covering the tips use strips of tissue only 1-1/2" wide; in this way a wrinkle free covering may be obtained. The entire model is water sprayed and held in a rigid position to prevent warping. After drying, if a wrinkle still persists try water spraying that area again; if it does not come out this time remove that section and cover over again. After it finally dries, give the wings and tail one coat of dope and the body two.

The decorations are added by cutting out of black tissue. Draw your desired design on a sheet of letter paper, then thumb tack it down on the work table over the tissue and cut out the design through the letter paper and also through the tissue. The tissue design can be applied with thin banana oil. The particular color used on the original model was: orange fuselage, rudder with alternating sections of dark blue, and orange for wings and tail. It has been found by the author to be exceedingly visible at high altitude, standing out as the proverbial sore thumb.

Propellor—The success of a model lies greatly in the success of the builder as a propellor carver. Layout the block as shown and cut with a power jig saw in order to assure sharp perpendicular edges, especially around the hub. Carve as a right handed propellor with about 1/4" undercamber. The crossection of the blade should be similar in shape to an airfoil, being thicker at the leading edge and tapering toward the back. Add a piece of 1/32" birch plywood 1" in diameter at the back of the hub as a base on which to build the spinner in order to assure perfect roundness. The counterweight wire is added before the spinner is glued into

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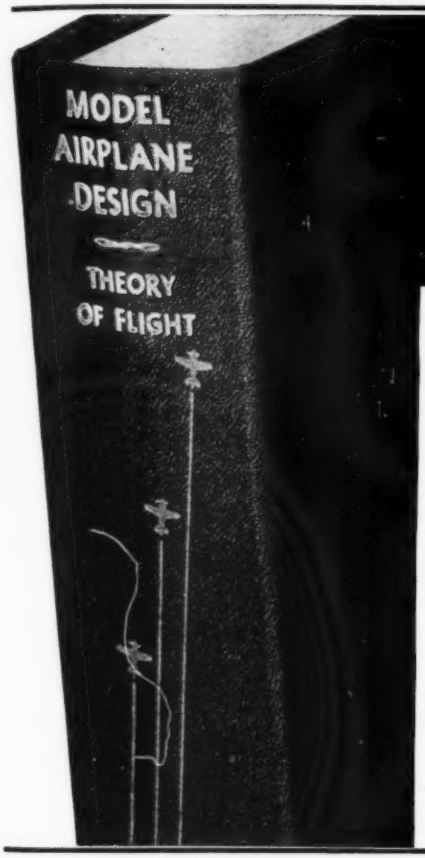

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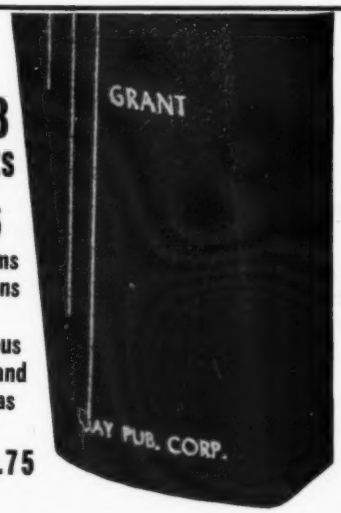

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CHARLES HAMPSON GRANT

—Princeton Engineering School; Massachusetts Institute of Technology; member of the "Early Birds"; for 20 years the world's foremost model flying authority; for the past ten years Editor of MODEL AIRPLANE NEWS.

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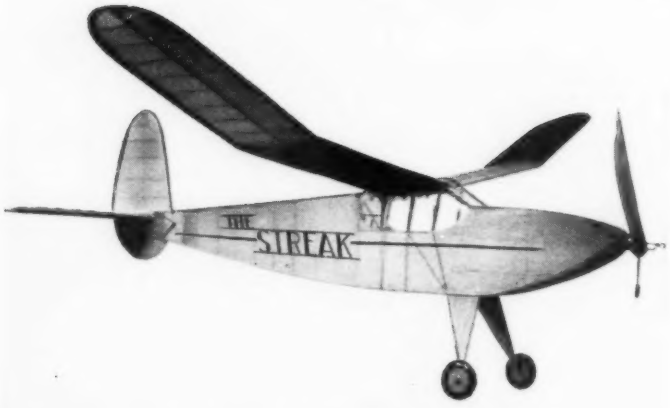

High aspect wing and single blade propeller give super efficiency

position. Wrap with silk thread. A brass bearing is placed on each end of the propellor hub as well as on each end of the nose plug.

The entire propeller is sanded smooth and covered with fine silk to prevent splitting. The silk is applied with dope. Give the propellor about 5 coats of dope mixed with talcum powder and sand between each coat with fine sandpaper. Finally give about 3 coats of clear dope and you will have a really flashy propellor. The lead weight is formed by wrapping paper in many layers around a wood dowel about 1/4" diameter. Then pull the dowel out about 1" and, holding the counter weight wire down in the empty space, pour in hot lead. Allow to cool and remove the layers of paper and you will have a smooth, round counter weight. File down to balance. Bend a shaft, and spring and add the ball bearing washer thus completing the propellor unit.

Flying—Assemble the completed model with rubber bands. The power used is 24 strands of 3/16" rubber, 36" long. In time this may be increased to 28 strands for a super climb. The wing and tail as shown on the plans are at the right angle of incidence. The nose plug should have about 2 degrees down thrust and no right thrust as the complete turning action is taken care of by offsetting the rudder slightly to the left (looking from the front).

Put in about 100 turns and notice the attitude of the plane. It should fly in large right circles under power, gradually becoming tighter in the glide. Thus under full power the model will climb steeply straight away from you, gradually circling to the right as the power becomes less, and finally on the glide doing a tight right circle. This is advantageous in that the model leaves the field into the wind, then passes back over head and finally away from the field, allowing it to be seen by the timer for a longer period.

Be sure to put your name and address on your plane because you now have a real out-of-sight performer on your hands. Good luck!

VICTORY

The Rising Tide

(Continued from page 7)

and still fulfill the destiny mapped out for our nation, than we can destroy our school system and still live. Now, in war, we must fly or die. In peace, too, we must fly or die.

Two government agencies are placing aviation study in the secondary schools. They are the U. S. Office of Education, headed by Dr. John Studebaker, Commissioner, and the Civil Aeronautics Administration, with Charles I. Stanton, Acting Administrator, and Bruce Uthus in direct charge of our aviation education efforts.

In order for America to fly, Americans must become "air-conditioned." By that I mean, we must become conditioned to the air and the machines of the air in just the same way that we are conditioned to the ground and the machines of the ground. We have got to get the "feel" of the air and the airplane into our bones, so to speak.

To become air-conditioned, we must be educated. To become really educated in the matters of aviation we must start early. Therefore, the program of air-conditioning America should begin where we are now placing it, in the elementary and secondary schools of the country.

Readers of this magazine know that many moves have been made in this direction. MODEL AIRPLANE NEWS itself has been of great value in educating boys and girls in aviation. It has fostered and promoted interest in model design, building and flying. Its alumni and alumnae are numbered today in the thousands, and many of them are now pilots who started by building the planes

pictured in this magazine.

Many others, both organizations and individuals have worked along the same or parallel lines. The result is that America is already an air-minded nation. There are millions of boys and girls eager and willing to take up the study of aviation, beginning in their early grades at grammar school. The problem has always been how to get a nationwide program of aviation study worthy of the name under way. We believe we now have that problem solved, and many of you will return to your class-rooms next Fall after your summer vacations to find aviation courses ready for you, and aviation subjects woven into other subjects such as physics, mathematics, geography, history and many others.

The U.S. Office of Education and the Civil Aeronautics Administration of the Department of Commerce are now arranging for such aviation study.

An Aviation Education Research Project was established at Columbia University in the Spring of 1941, under the auspices of the Civil Aeronautics Administration. Its purpose was to determine what aeronautical studies are necessary for the most effective preparation of young people for flight training. It is now arranging to provide teachers' manuals for classroom use, as well as texts, maps and other suitable material. The work of the Project is directed by Dr. N. L. Engelhardt; other members of the Research Committee are Drs. Paul R. Mort, Ben D. Wood and G. L. Renner. Conferences are now being held throughout the country on a regional basis, and in some of the larger states.

It is important to know the background of this education program. It isn't a "Topsy" program that just grew. It has come out of a mass of experience which we in the CAA feel is certain to make it succeed.

In 1938, thirty-five years after the Wright brothers had made their famous first flight at Kitty Hawk, there were in the United States only 10,000 civil aircraft of all types including commercial. Civilian pilots of all kinds totalled a mere 22,000. Airplanes were expensive. Flying lessons were expensive. Insurance was expensive, and many who had bought airplanes soon gave them up for lack of airports and other facilities. In spite of the stimulus given flying during the First World war, civil aviation was not considered sufficiently important to warrant any Federal sponsoring agency until 1926. The funds of the agency were small, its authority was weak. Not until the summer of 1938 did our Government first establish an adequate central agency to encourage civil aviation—the Civil Aeronautics Authority.

Meantime, during the middle thirties, great strides had been made in broadening popular knowledge of aviation in other countries, notably in Germany. More than a million members of the Hitler Youth organizations were building model airplanes in the primary schools. More than 100,000 older boys were in gliding and soaring camps. The Nazis were annually training 65,000 pilots and mechanics. Every year they graduated 25,000 of these into the armed services—with results that we all know.

That was the situation in 1938 when the CAA took over and decided to do something about it before it was too late. We eliminated cut-throat competition among the commercial airlines and made it possible for them to enjoy a sound healthy growth. Passengers carried on the airlines jumped from 1,250,000 in 1937 to 4,000,000 in 1941. We improved and extended the CAA airways system. It now totals 32,000 miles, serviced by more than 3,000 workers and technicians. This is a priceless war asset. Today 80 per cent of the traffic along these aerial highways consists of military aircraft hurrying from point to point.

But it seemed to us that even more than this was needed if America was to keep up with the times—if it was to become a nation on wings, a great air power, as it rightfully should. What was obviously needed was to encourage more people, especially young people, to take up flying, to get used to the airplane and accept it as a matter of course, to develop techniques and skills until they rode a plane as easily and naturally as a cowboy rides his pony, or a South Sea Islander swims.

There were two ways of doing this. One was from the top down, the bureaucratic way, by having the Government build a few elaborate training centers and operate them with Federal personnel under complete Federal control.

But we favored the decentralized and democratic way of carrying aviation to the people. We decided to encourage fruitful development of local facilities rather than concentrate on static and sterile regulations by remote control. Once again experience has proved, if proof were needed, that you can confidently trust the sound common sense and judgment of the American people.

First, we approached the colleges and offered them assistance if they would undertake to teach ground courses—the theory of aviation. Hundreds responded.

But there was still one big problem—Where were students going to be taught to fly?

There were, we knew, hundreds of small private flying schools scattered all over the country, some of them near the colleges. We

knew they were staffed with men as technically competent as any who ever took a ship off the ground. Many were the pioneers of aviation. They loved it and had devoted their lives to it. Yet few were on a sound financial footing. Almost all lacked adequate equipment.

I shall never forget the hoots that went up when we suggested that the Government should contract with small flying schools to teach the art of flying to students taking ground courses in nearby colleges. But we were convinced that if high standards were established, these men could and would do a good job, under proper supervision.

What has been our actual experience?

Results have been far beyond anything any of us expected or even dreamed of. We began experimentally in 1939 with $100,000 and trained some 300 pilots in thirteen colleges. Satisfied that our scheme would work, we asked an appropriation of $10,000,000 the next year to train 20,000 pilots. We received only $4,000,000, and by stretching that as far as we could, managed to train some 10,000 private pilots. Each of them had completed a 72-hour ground course and 35-hour flight course in a light plane. Then, in May 1940, with the Nazis swarming over Europe, the President requested and the Congress voted an appropriation of $37,000,000, an increase of more than 800 per cent, to provide a huge reservoir of partially trained civilian pilots upon which the armed forces could draw for their needs. As Major Williams has well said in his column, "Pilots with 35 to 50 hours in the air are not fighting pilots. But they are airmen. And it's from airmen that fighting pilots are developed."

All told we have taught more than 75,000 young Americans to fly. Some 15,000 of them are now flying for the Army and Navy; 9,000 more are in other branches of the armed services. We have turned out 2,500 instructors. In the colleges there is a great reservoir of 25,000 licensed pilots ready to serve when called. To provide pilots with basic and secondary training, we are today operating some 700 training centers. Almost 600 colleges now offer ground school instruction in their catalogs; each is associated with a local flying school. Perhaps there is such a flying school in your neighborhood; and let me say that if you haven't looked into it, you've certainly missed something.

Let me just mention one fact about the program—its amazing safety record. In training 75,000 flyers there have been just 18 fatalities. Insurance premiums have been cut six successive times—from $20 to $4.90. CAA students have now rolled up a record of 11,000,000 miles per fatality!

The CAA has done a great deal in meeting a vital and urgent need, but we are still not satisfied. Because we started late, we had to begin our training courses at the college level. But that was to start "wrong end to." Instruction in the rudiments of aviation should begin in the elementary and secondary schools. It should be integrated into the curriculum from the bottom up. All children, even the youngest, are interested in planes and what makes them go. More than three million youngsters are now building and flying model airplanes, largely out of school.

In addition to academic subjects, the plan is to instruct grammar school pupils in the design, building and flying of model airplanes. In high school, girls and boys will learn to design, build and fly gliders. In college, they will be taught to fly powered planes, and will be carried along further in their study of aerodynamics, meteorology, air navigation and all the subjects necessary to fit them to live in an age of the wing.

This program too will be done in a strictly American way. Nobody is telling the schools what they must do. Certainly the CAA and the Office of Education is not arbitrarily deciding on what shall be taught, what text shall be used; in fact, we are deciding on none of the details. Again, the matter is handed down from government to the people who must do the work, and they can choose what they will do.

Not all teachers have had experience in aviation which qualifies them to teach aviation subjects. The research committee and the special aviation education consultants of the CAA have prepared several helps to teachers of physics, geography, sociology, history and the various sciences. These include lists of books available for home reading, or as reference books in connection with classroom study; teachers' syllabi; outlines showing how aviation subjects can be woven into existing courses; suggested subjects for discussion such as "Air Power in the War"; "Air Power and Peace"; "Aviation in Trade and Commerce of the Future"; "Government Control and Aviation"; and "Aviation and your Community's Future."

Great and important subjects open up for study when the school adopts an aviation education program. Even the air we live in is a subject with tremendous implications on our physical, social and economical lives. Geography is being made over almost entirely by the airplane. Aviation literature is developing rapidly. Aviation has applications to biology, general science, physics, arithmetic, fine arts and industrial arts. All this refers to the effect aviation is having on our lives in general.

There is the whole new field of aeronautics, the art of mechanics, the special study of the weather with relation to flying, and the practical study of the plane itself and its power plant. We have only to consider what the airplane has done to change life all over the world to realize that it must be the subject of study in all schools.

VICTORY

Air Youth

(Continued from page 28)

Aircraft Silhouettes" wall chart which helps identify fighting planes of World War II.

Special training and visual aids will be mailed to Flight and Squadron commanding officers as they are released.

A. M. A. Assists N. A. C. A.

In a recent communication to A.M.A. Headquarters Charles A. (Tom) Hulcher, a member of the A.M.A. Contest Board and former Vice President of the Academy from the Fourth District, publicized the part the Academy has been playing in securing employees for the Langley Field laboratories of the National Advisory Committee for Aeronautics. Mr. Hulcher wrote

as follows:

"I should like to take this opportunity to sincerely thank the Academy for the excellent job you have done in assisting our Laboratory in obtaining so many excellent Under Aircraft Modelmakers.

"Boys from practically every state in the Union are under our employ at the NACA and are busily engaged in many types of urgent national defense work. The vast importance of the Academy's program of fostering and encouraging model building is clearly demonstrated in the performance of these modelmakers in our defense effort. A few vacancies still exist and we would be interested in reviewing additional applications.

"The new courses in Aviation for the District of Columbia high schools is definitely a step forward. I regret at this moment I am not able to suggest the names of any qualified teachers.

"I trust that your request for priorities for model aircraft material will be granted. This is a most important work and you have done an excellent job of it."

Aviation Education Developments

With aviation playing a more important part in the war each day, refreshing developments have been taking place in the field of aviation education and pre-flight training.

One of the most significant moves has been a five-day air training conference in Ottawa in which representatives of 14 of the United Nations participated. Out of the session came the announcement that a United States-Canadian-British committee on aviation training will be established in Washington.

It is obvious that the training of personnel for air crew and ground crew means more than enlisted men completing intensive courses of study. It may be expected that the Ottawa conversations must have veered around to pre-flight and pre-enlistment training. A public report on the committee's plans is expected soon.

The Office of Education has for distribution "Pre-Aviation-Cadet Training in High Schools,"* which tells the high school precisely what the Army and Navy wants their future air and ground personnel to know, and what type of physical training the prospective aviation cadet should undergo prior to enlistment.

A one-year course outline in pre-flight aeronautics prepared by the Pre-Flight Aeronautics Curriculum Research Project at the University of Nebraska has been released under CAA auspices. The aims of the course are to give to boys and girls in the 11th and 12th grades aeronautics instruction which will materially shorten the period of specialized training necessary for those who expect to participate in the nation's air program.

In a series of regional and state conferences, educators are being brought together to hear of the immediate need for education for the air age. A preliminary report on how all schools can participate is contained in a study released under the direction of Prof. N. L. Englehardt of Columbia University.

In the introduction of the report, the research staff explains quite simply that "the world has entered upon the 'air-age.' This creates new responsibilities for teachers and school administrators. They are obligated to orient children, youth and adults to the problems arising from the development of transportation and communication by air. This holds equally true for peace as well as war times."

Suggestions are outlined for inclusion of aviation material in social studies, geography, English, biology and general science, elementary school science, arithmetic and

mathematics, physics, fine arts, and industrial arts.

*Leaflet No. 62, U. S. Office of Education, for sale by the Superintendent of Documents, Washington, D. C., 5c.

Junior C. P. T. P.

Perhaps the most forceful development to date, and one that will be accorded the greatest interest on the part of the public and the educators, is the introduction of flight training for boys still in high school.

An experimental program in 21 high schools embracing 210 students has been set up by CAA. To open the courses to boys of high school age, the minimum age requirement for CAA training has been lowered to 17. If the applicant is 18 or more, an integral part of his enrollment will be his enlistment in the reserve of the armed air forces. If the high school student taking the instruction is not yet 18, he must sign a pledge to the effect that upon attaining his 18th birthday he will apply for enlistment in the reserve, regardless of whether he is still receiving CAA training or has completed it.

Operating in 20 states, the plan is awaiting only the "go-ahead" signal from regional CAA supervisors. The schools where the flight training will be given have been selected, and applications from students are now being accepted.

Holyoke Club Has "Swap" Program

The Holyoke (Mass.) Gas Model Club has insituted an interesting "swap" program to cope with the threatened shortage of model materials. In a letter to headquarters, Robert E. Ezold, Senior Advisor of the Club, writes:

"Model building and flying in this section has enjoyed the finest year ever under the A.M.A. rules and regulations.

"The shortage of materials listed in the report has inspired me to write your office as to a plan our Club has used in the past and could possibly help all model builders throughout the country. Even the manufacturers could benefit through a well planned scheme. The plan is this:

"We have a special listing on a bulletin board reserved for club members who have motors, parts or equipment not being used; also with price asked. Many members have avoided long weeks of waiting and, in many cases, a complete disappointment by finding just the missing parts or complete units right handy.

"Right here in Holyoke many motors are just stored or pushed aside, and I am sure a goodly number could be brought to use. An arrangement with the manufacturers to recondition the old motors would help everyone connected with model aviation."

Cloud Dusters vs. Prop Busters

In a letter to headquarters, Guy E. Dake, A.M.A. contest director of Oakland, California outlined current aeromodeling activities in the Bay Cities area. A portion of Mr. Dake's report follows:

"The Oakland, California Cloud Dusters recently challenged the Elmhurst Prop Busters to a club contest to see which had the best flyers. When the smoke cleared away the Oakland Cloud Dusters won by 6/10 of a second. All flights over 5 minutes were unofficial. The total number of flights of each Club, and the time divided by the number of flyers, gave us an average. There was quite a wind blowing so that the winning time was very low—1.26:4.

"The Oakland Junior Chamber of Commerce, working with the school department, is going to put on a show in the Oakland Auditorium on May 21st as an educational program for model aeronautics. Mr. Harvey Robbers, an A.M.A. Contest Director, President of the Oakland Cloud Dusters, and President of our Central Council of Model Aeronautics, has opened his home as headquarters for those who want to work on the identification models in the evenings. I am also 'parking' models for the duration for many fellows who are going into the service. The Oakland Cloud Dusters are making models and judging jigs for the identification models, and will probably have to judge most of the models for the school department. We have also secured help from the Navy for our show. There will be all types of models at the show; indoor, outdoor, solid and gas models including one made and flown with steam in 1909."

Copeland Broadcasts Reach Century Mark

On Friday May 29th Harry C. Copeland of Syracuse, New York delivered his 100th weekly 15-minute broadcast "Youth in Aviation." This program has been presented over radio station WOLF and is a contribution on Mr. Copeland's part for the "cause" of model aviation.

A number of prominent aviation leaders sent congratulatory messages to Mr. Copeland in conjunction with the coming anniversary. Among these well-wishers were Dr. George W. Lewis, Chairman of the N.A.A. Air Youth Board; Lester D. Gardner, Executive Vice President of the Institute of Aeronautical Sciences; Robert H. Hinckley, Assistant Secretary of Commerce for Air; Gill Robb Wilson, President of N.A.A.; and others.

Mr. Copeland figures that he spends an average of five hours in the preparation of

the weekly program. As a state councilor for the Academy of Model Aeronautics, Secretary of the Syracuse Aeronautic Association, and active in work of the National Exchange Club's aviation committee, he is well qualified to carry on this task of acquainting the public with "Youth in Aviation."

Akron Says "Keep 'Em Building"

The Akron *Beacon-Journal* in its Air Cadet column has recently been publicizing the slogan, "Keep 'Em Building!", as applied to the model builders. The slogan is the idea of Miss Frances Alexander, President of the Akron Women's Chapter of N.A.A. Miss Alexander has had wide experience as a leader in the junior aviation field, and has retained active interest in the current aeromodeling program.

What About Gliders?

Put aside that crying towel. What difference does it make if you can't have the pleasure of flying your pet gas job? The old saying of modelers . . . . . "anything will fly with enough power," only goes to prove that gas models never were all there was to real model flying.

Now we've built gas jobs—plenty of them! Some were good and others we'd rather not talk about. Some of them had a climb like a super-charged rocket and a glide like a brick. Others had a disgusting climb and a glide like a blimp. Somehow we were always getting close to the ultimate but never quite reached it.

Last year we decided to really look for the answer. Of course, we could read books and texts of experts; but after all, Edison never listened to formulae—he just experimented. We decided to toy around with outdoor gliders.

First we built a Class B hand-launched job. After several of these we turned to Class C hand-launched gliders, and eventually we "drifted" into the tow-line class. Right here and now we get up on the rostrum and publicly state that tow-line gliders are the top thrill we have ever enjoyed in modeling. Once they are properly adjusted their glide will put *any* gas job to shame. Once they hit a thermal and begin that slow circle, the only answer is to start chasing 'em.

Our first tow-line gave us fits, and no kidding. We found that the high-aspect wing had warped with "positive" in the tips. That was corrected. The ship showed a diving tendency when we released it from the tow. After several hours of trying we had the answer. The glider took the full 75 feet of line, dropped the hook properly and started to circle. For all we know it is still circling somewhere over the Irish coast . . . at any length we never saw it again.

We built another ship of the same type. It, too, behaved well until it hit an obstruction and telescoped. Our third tow-line was a seven footer. It was designed after a famous gas model and required many hours of adapting but it flew too darn well . . . . . some 40 minutes o/s and for a Class F ship (if there is such a class) it was super.

Out on Long Island (our present residence) our fliers are seriously considering a glider contest in the future. Think of it—no noise, no motors stolen, but still plenty of *real flying*. Gentlemen, that's paradise!

Glider records on the A.M.A. charts are pretty poor. We've seen tow-lines do 20 minutes with ease. Still, the average record is but little over two minutes average. Why not a real contest for tow-lines with prizes such as they award in big gas contests? Why not some real thought in the design of such ships? How about it fellows?—*Carroll Moon*

FLYING SCALE MODEL RULES

as adopted by

Flying Scale Model Committee of the
Academy of Model Aeronautics
Victor R. Fritz, Chairman
Walter S. Eggert, Jr.
Chester Lanzo
Dan K. Penny
Thomas Wildon

OUTDOOR

A model, to be eligible in this event, shall be an exact replica of a man-carrying machine, every part being proportional in size to the corresponding part of the larger machine. No part of the model may be larger or smaller in proportion to improve its performance except that the propellers may be altered in blade width, pitch and diameter.

The model shall be rubber powered.

The effective projected wing area of models in this event shall not exceed 300 square inches. The name of the contestant, name of the ship, the effective projected wing area and weight of the model shall be plainly marked on the wing of each model entered.

Models shall weigh not less than three ounces for every 100 square inches of wing area.

All models will be judged according to the following point system:

1. General Workmanship:

Neatness of workmanship	20	points
Amount of detail	12	points
Finish	10	points
Total	42	points

2. Fidelity to Scale:

Fuselage	7	points
Wing	6	points
Empennage	6	points
Landing gear	5	points
Engine, cowl, propeller, etc.	4	points
Total	28	points

Some builders go into more detail than others, reproducing engine cylinders, instrument boards, interiors, controls, lights, etc.

In addition to the seventy points for workmanship and scale, additional points up to a maximum of thirty points will be awarded in proportionate amounts between zero seconds and of the maximum official flight made.

Each contestant shall be allowed three official flights.

Scoring time will be the average lapsed time of three official flights.

Models failing to make an official flight of five seconds or more will not be eligible for awards.

In case of a tie in total points scored:

(1) Highest score in workmanship.

If still tied:

(2) Highest scoring time in flights.

A contestant may present only one model to be judged for workmanship. If this model cracks up before an official flight is made, a second or third model may be presented in succession, to be judged for workmanship.

The model, with full size scale drawing (scale indicated) and the authentic plans of the man-carrying ship, must be submitted to the Flying Scale Model Judges. The contestant may also sub-

mit photographs or any other information pertaining to the model, to prove its authenticity, which will aid the Official in judging the model for scale and workmanship.

Where conclusive certification is not presented as to authenticity of the plans, only the Judges' decision will be considered.

A certified plan is one from an official source that supplies the full dimensions of the man-carrying ship.

By not supplying plans that are certified, a contestant places himself at a disadvantage, particularly if his model is of an experimental or an old or uncommon aircraft.

The structure, finish and detail of the model should reproduce the airplane as nearly as possible. Illustration: A colored doped model will have an advantage over a model not finished as the man-carrying ship.

INDOOR

A model, to be eligible in this event, shall be an exact replica of a man-carrying machine, every part being proportional in size to the corresponding part of the larger machine. No part of the model may be larger or smaller in proportion to improve its performance except that the propellers may be altered in blade width, pitch and diameter.

The model shall be rubber powered.

The effective projected wing area of models in this event shall not exceed 150 square inches. The name of the contestant, name of the ship, the effective projected wing area and weight of the model shall be plainly marked on the wing of each model entered. No weight rule.

All models will be judged according to the following point system:

1. General Workmanship:

Neatness of workmanship	16 points
Amount of detail	9 points
Finish	7 points
Total	32 points

2. Fidelity to Scale:

Fuselage	6 points
Wing	5 points
Empennage	5 points
Landing Gear	4 points
Engine, cowl, propeller, etc.	3 points
Total	23 points

Some builders go into more detail than others, reproducing engine cylinders, instrument boards, interiors, controls, lights, etc.

In addition to the fifty-five points for workmanship and scale, thirty-five points will be awarded for the longest official flight. Scoring for flying shall be the basis of the longest official flight and a proportionate number of points will be awarded between zero seconds and the longest official flight.

Each contestant shall be allowed three official flights.

Scoring time shall be the longest single official flight.

Models failing to make an official flight of five seconds or more will not be eligible for awards.

In case of a tie in total points scored:

(1) Highest score in workmanship.

If still tied:

(2) Highest scoring time in flights.

A contestant may present only one model to be judged for workmanship. If this model cracks up before an official flight is made, a second or third model may be presented in succession, to be judged for workmanship.

The model, with full size scale drawing (scale indicated) and the authentic plans of the man-carrying ship, must be submitted to the Flying Scale Model Judges. The contestant may also submit photographs or any other information pertaining to the model, to prove its authenticity, which will aid the Official in judging the model for scale and workmanship.

Where conclusive certification is not presented as to authenticity of the plans, only the Judges' decision will be considered.

A certified plan is one from an official source that supplies the full dimensions of the man-carrying ship.

By not supplying plans that are certified, a contestant places himself at a disadvantage, particularly if his model is of an experimental or an old or uncommon aircraft.

The structure, finish and detail of the model should reproduce the airplane as nearly as possible. Illustration: A colored doped model will have an advantage over a model not finished as the man-carrying ship.

GAS MODELS

Concerning the Flying Scale Model Aircraft powered by internal combustion engine(s), we feel that this would prove to be a very interesting class and that every effort should be made to popularize it.

The Committee does not feel ready to assert a definite opinion on these matters until we have tried out more extensively certain rules in actual competition. However, here are some general ideas.

Flying Scale Model Aircraft, powered by Internal Combustion Engine(s):

1. Apply the rules for Outdoor Rubber Powered Flying Scale Model Aircraft
   a. In regard to judging the workmanship and scale
   b. In regard to proportioning points for flight time.
2. Apply the rules for Outdoor Model Aircraft, powered by Internal Combustion Engine(s).

VICTORY

Stratofly the Sunduster

(Continued from page 15)

cement on the two tail skids.

The rudder is built *flat;* all edges are cut from 1/4" sheet. When completed the entire assembly is sanded.

FINISHING TAIL ASSEMBLY—First cover elevator, preferably with silkspan. Dope both sides at once to prevent warps; give it three to four coats of clean dope with a light 10/0 sanding between coats.

Now cover the rudder in the same fashion. When you have doped rudder, glue it onto the top of the elevator. Make sure it is at right angles to the elevator by using a T-square.

You may add a former, corresponding to former "J" on the body, and make a fillet between the rudder and elevator, of silk. This will add to the streamline effect of the ship.

THE WING—The first step is cutting all the ribs as shown on plan. Cut all the main ribs, and then put them in a vise and sand as a unit—this will give you all the ribs of uniform size. Then cut and sand the tip ribs two at a time.

Now cut the trailing edge and tips of 1/4" hard firm balsa. First build any center section by pinning the front bottom spar of 1/4" x 3/8" onto the plan. Remember to extend all spars at least 1 1/2" in order to be safe in case of a mistake. Notch the trailing edge to correspond to the ribs, and pin down to the plan. Next step is to insert the ribs on the spar and glue. Glue on the leading edge of hard 3/8" square balsa into the notched ribs. Glue on the top front spar of 1/4" x 3/8" in the notched ribs.

After the assembly has dried, remove it from the plan and insert the rear spar of 1/2" x 1/4" hard balsa, and reglue all joints. Build the other three sections in the same manner. First join the tips in this fashion:

Pin down a finished center section to plans, and square all the three spars. Fill in the two center spars with 1/4" sheet balsa to the first rib. Obtain a block 6" high and block up the tip. Mark off the angle on the spars and cut the spars. You may also obtain same angle by the gussets on the printed wing plans. Fill in the front spars as on the center section, and cut the four dihedral gussets of 3/16" sheet (1/4" sheet for center splice) and glue the spars together, pinning the gussets in place. Make the center dihedral splice in the same way, using sheet balsa gussets of 1/4" sheet and use a 4" block to prop up center sections. You will note that all the dihedral ribs will

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have to be notched to a larger space to accommodate the gussets. When these joints are all dry, all the other braces—such as leading edge, trailing edge and rib triangular gussets—are now ready for insertion. Then reglue the dihedral joints several times. This type of dihedral brace has been used on many models and was found to be very strong, especially to shocks and strains.

FINISHING WING—Sand all the spars, leading and trailing edges. Do a nice job of the tips, making same smooth and streamlined. Covering the wing with silkspan is recommended, but silk may be used. Give wing three to four coats of clear dope. Cover with colored paper, and use another color as a small trim. This wing has a lot of area (1050 square inches), so if you completely color dope same the wing will gain much weight.

ADJUSTING AND FLYING—Take your finished Sunduster out to a field—a big one—and start assembling the ship. First, tie the tail assembly down to the body with 3/16" rubber; see that it is horizontal to the fuselage. Now set down the ship and tie on the wing with 3/16" rubber and see that it is lined up with the fuselage and tail.

Run along with the ship, minus the prop, and just let her lift from your hands. It probably will not lift from your hands, because the original needed 1/4" incidence under the trailing edge of the elevator, and 1/8" incidence under the leading edge of the wing. After adding these she probably will float out of your hands.

Try some hand glides. Set the rudder about 1/8" toward the right (looking from the rear) and set the wing so the leading edge of the left wing is slightly forward. This will prevent spins under power.

If your motor has less power than an Ohlsson 60 or a Super Cyclone—such as Browns, Denny's, etc.—you will not need the upthrust. But if you use a high powered motor you cannot be without it—so insert a washer on each side of your motor under the rear bolts between the motor lugs and the motor mounts; remember that the motor is mounted beneath the mounts, not above.

Now, for the first power flight, start your motor and get it running smooth at a low speed. Set timer for not more than ten seconds, and run with ship until it lifts out of your hands. *Do not throw it!*

The Sunduster should go up in a slight left turn; and when the motor cuts she should roll into a smooth, flat glide to the right. Fly with more power until you have reached your peak. The ship will not need full power of *any* motor. As the power is increased the ship will turn more to the left under power, and may need very little right rudder, which will give more turn to the glide.

In conclusion, I would like to say that in The Sunduster you will find an airplane that will live up to your wildest expectations. But, if you want some of the Spring and Summer contest prizes, do not rev her up or else she might do some "sundusting!"

VICTORY

Nippon Nemesis

(Continued from page 25)

framework of laterally-laid channels and bulkheads, longitudinal stiffeners and 24-STAL aluminum alloy "Alclad" skin plating.

The tail surfaces consist of a single horizontal stabilizer mounted atop the fuselage aft portion, and a single elevator, two vertical stabilizers mounted at the extremities of the horizontal stabilizer and two rudder assemblies complete with trim tabs controllable from the cockpit while in flight. The stabilizer structures are of similar ribs-stiffeners-sheet design to that of the main wing panels, rudders and elevator being of metal construction, fabric covered. All

control surfaces are statically and dynamically balanced through the use of lead weights bolted into their leading edges.

The engine nacelles are built in three sections: the engine mount and cowling; the center supporting structure secured to the inner wing spars; and the aft section which houses the landing gear in the retracted position. The center structure mounts the main landing gear trunions and retracting mechanism.

Landing gear is the tricycle type, consisting of a nose gear which moves rearward and upward into the nose keels just under the front gunner, and the two main wheels which retract similarly into the engine nacelles. Retraction is by hydraulic actuating cylinders; both *up* and *down* position latches lock the gear in the desired position. To prevent mud or dirt from being thrown into the landing gear recesses when the gears are down, the landing gear doors fold back up as the gears reach their full down position. A small portion of the main gear doors remain down to provide clearance for the shock strut.

The B-25 is powered by two Wright 14-cylinder double-row air-cooled radial engines model R-2600-9, mounted in the forward portion of each engine nacelle on steel-tubing welded engine mounts bolted to the front spar of the inner wing. This engine has a maximum power rating of 1500 horsepower.

The propellers are Hamilton-Standard three-bladed all-metal controllable pitch design of the Hydromatic full-feathering design.

The crew is normally composed of: a bombardier located in the front enclosure who also acts as a nose gunner when the occasion warrants. His seat is located near the aft end of the enclosure at which point he may sit erect and act as an observer, transmitting his information to the radio operator via the interphone. As the target is neared he moves forward and, on his hands and knees, crouches over the bomb sight located in the extreme nose of the ship.

The main command compartment is located aft and above the nose section and houses the pilot, co-pilot and radio operator. The pilot is seated on the left of the cabin and handles the flight, engine and certain equipment controls. The co-pilot is seated on the ship's right side, where he handles landing gear, flap and trim tab controls and various other of the hundred-and-one equipment controls. He takes the wheel to relieve the pilot over long flights and it is logical to assume that the co-pilots of the Tokyo raiders got a workout on that extensive flight. Immediately aft of the pilot compartment is the radio operator and navigator located in a special compartment which houses the command set radio receiver and transmitter, the direction finding equipment and the plotting port with navigation charts.

Fifth member of the crew is the tail gunner located in the extreme aft end of the fuselage, from which vantage point he commands an unlimited view of the rear hemisphere of the airplane. Due to the limited dimensions of this portion of the fuselage it is necessary for him to lie on his stomach when engaged as a tail gunner; but for long flights he moves forward and is provided with a seat within the main fuselage. A sixth member of the crew is frequently carried in this same compartment to carry out various engineering duties such as the camera, tow target windlass, etc., but primarily to operate the side guns when intensive enemy air action is anticipated.

Armament aboard the B-25 consists of three 30-caliber machine guns, one 50-caliber machine gun and the bomb load. The nose gunner carries a single 30-caliber machine gun within the nose compartment which he fits into any one of three sockets provided in the transparent panels as the location of the enemy attackers determines. These quickly detachable sockets require that he work fast, but make it possible

for him to cover the complete forward hemisphere of the ship with a single gun in place of three actually needed for the purpose. The sockets are located in the extreme nose forward, the upper portion and the left side.

The tail gunner handles the big 50-caliber weapon through the rear enclosure which splits along its vertical plane and exposes the gun. It is mounted on a special fitting, enabling the tail gunner to cover the entire rear hemisphere of the airplane.

The sides of the fuselage just forward of the tail surfaces are opened by sliding back transparent panels, and a 30-caliber machine gun is mounted on special waist mounts on each side of the fuselage so that one man can handle both guns by moving from side to side as enemy action demands.

The release controls are mounted in the front bombardier compartment from whence the bomb bay doors are opened and the bombs dropped as the target passes under the bombsight mounted in the nose.

The B-25 has a wing span of 67 ft. 6 in., is 54 ft. long, and stands 14 ft. 10.5 in. in height on the ground with the thrust line level. Gross loaded weight is 24,000 pounds, and maximum speed is over 300 m.p.h.

Actually, our Plane-on-the-Cover this month is the B-25B type incorporating the tail gunner emplacement shown on the drawings. The B-25 was the original design and the B-25A had a conventional tail gun emplacement which proved too cramped for the necessary action. A later and vastly improved model of this deadly warplane has recently appeared as the B-25C. This ship has both top and bottom power-operated multi-gun turrets in addition to the gun emplacements fitted to the earlier models. Also, it has more powerful engines and various refinements of design which give it a speed and climbing ability far in excess of the model herein described; but we're afraid the Japs might be just as interested in facts concerning it as you are, particularly after Doolittle passed over in clear sight of Emperor Hirohito's palace in one of that type.

So it is small wonder that Doolittle and his men chose the powerful B-25 type for their deadly mission. And it will be little wonder when perhaps hundreds of these raid Tokyo and Yokohama and Hakodate and Nagoya and all the rest of the enemy's centers of production. They did it before and they can do it again!

VICTORY

Flash News

(Continued from page 2)

Daimler-Benz DB-601C1N engine of 1200 h.p. which gives it a top speed of about 330 miles per hour at 18,000 feet. This can be compared with the many 400-miles-per-hour fighters Uncle Sam is now rolling off of assembly lines by the hundreds!

The Marines, as always, have not been out-done in the use of gliders for flight training and it was recently revealed that officers and men of the Marine Corps have been undergoing training in gliders since the summer of 1941! Lt. Colonel V. M. Guymon made the announcement from his post as commanding officer of the school at Parris Island, South Carolina. He announced few accidents and no fatalities

throughout the first year of operation of the school. (And the Army and Navy thought they had something new!)

The first unit of the N.A.C.A.'s giant research laboratory at Cleveland, is now in operation. It is an engine testing laboratory capable of testing engines up to 4,000 horsepower (experimental types of this great power have already been completed). The first of six major units, the lab was finished in just 1 1/2 of its scheduled 2 1/2 years allotted for construction. The entire project represents an investment of $18,000,000, but it has the finest such research facilities in the entire world.

Curtiss S03C-1 "Seagull" scout planes are now pouring from Curtiss-Wright's huge Columbus, Ohio, plant at "an immensely satisfying rate." The planes are powered by in-line Ranger engines and are equipped with either wheels or floats suitable for use on battleships, cruisers or carriers.

Frigidaire division of General Motors has, for some time, been in large scale production on 50-caliber aircraft machine-guns, airplane propellers and aircraft hydraulic equipment it was recently announced. From ice to hot lead over-night!

Buick Division of General Motors is now a full YEAR ahead on its contract for Pratt & Whitney R-2800 double-row 2,000 horsepower engines.

Ford Motor Company's unbelievable huge Willow Run plant in Michigan has completed its first Consolidated B-24 bomber just 13 1/2 months after the initial ground clearing ceremonies!

All of these amazing facts are the results of just SIX MONTHS work since that fateful December 7th at Pearl Harbor!

After many, many years of traditional meaning, the famed star-and-circle insignia of the United States Army and Navy flying forces has been changed. The familiar red circle which graced the center of the familiar cocarde has been removed from Army planes due to the possibility of confusion with the orange-red circle identifying planes of the Japanese air force. The insignia of the Yank planes is now a simple white star on a circle of blue, says the War Department, and all combat planes are being re-painted.

In eight experiment stations, the Army is producing silk, not the synthetic kind, but the honest-to-goodness worm kind. Met by the cutting-off of their giant silk supply from Japan, the Army experimented with Nylon and other substitutes but found nothing which could completely replace the work of the lowly silkworm in the production of material for badly needed parachutes for the thousands of fliers now being trained for the Army and Navy. Chief hitch in the proceedings has been the supply of mulberry leaves, the only known diet on which a silk worm will survive and produce. Silk-worm production is fast and the experiment stations state that soon there will be enough silk to supply the great majority of parachutes now needed provided the mulberry situation can be coped with.

FLASH NEWS recently chatted with Lieutenant Paulo Sampaio of the Brazilian Army Air Corps who is in this country on an official mission to study American airplane transport systems with an eye to set-

ting up a similar system in Brazil. He says: "We now produce 30,000 tons of rubber annually in Brazil which is available to the United States provided means of transportation exist. However, the difficulty of constructing roads makes it nearly impossible to transport over land and we are therefore turning to the air.

"We are not confronted with landing field problems as so many of our sister republics are, the two million square miles of the Amazon valley provides adequate seaplane landing space and that is where the rubber trees are located. If we can get enough seaplane transport planes built in time, we can supply enough rubber to win the war." Lieut. Sampaio will return shortly to organize a cargo transport system and Americans wish him success.

Mexico's naval bases and military aerodromes are now available to the U.S. Army and Navy ships and planes, it was recently announced by Jose Maria Davilla, Mexico's minister. These bases may prove of immense value for the location of anti-submarine patrol planes and landplane bombers on both the Atlantic and Pacific sides.

The giant Curtiss C-46 Army Air Forces cargo plane has been officially named the Curtiss "Commando" by the Army.

According to responsible sources in England, the real reason for the placement of the horizontal stabilizer high up on the vertical stabilizer of the wicked Westland "Whirlwind" fighter, featured on our cover last month, was to permit the pilot to bail out without fear of smacking into the horizontal surface, the cause of many deaths in the air during this second great war sounds plausible!

British circles have estimated that the Japanese have lost 5400 airplanes and are rapidly being cut out of the aerial picture. However it is interesting to see the mathematical line of reasoning followed by the British observers: actual figures based on United Nations communiques reveal a total loss of 1350 Japanese airplanes. The British officers say that this is conservative and that twice that number have actually been lost. In addition, working on the theory that one plane is crippled, heavily damaged, or hit for every one destroyed, this would place the total losses at the 5400 figure. Japanese warplane production is now hitting 800 planes per month.

VICTORY

Modeling Your Future in Aviation

(Continued from page 10)

curved shape.

In Fig. 10C the pointed tail fills in the turbulent area back of its perpendicular front face, so the airflow is quite smooth; the only break occuring at its upper and lower corners where the air must flow around it abruptly. These corners cause unnecessary resistance and if they were rounded the break would be reduced considerably. Fig. 10D illustrates the perfect streamline shape, which causes the least possible drag.

The greatest thickness in a low resistance body should be slightly forward of the center, usually 1/3 of its length from the front. Keeping this in mind, draw the outline of your bird's body then modify the forward part to conform to shape of the head with bill protruding from it; the plan shows how it should appear.

Construction—The glider is to be made as simple as possible of flat sheet balsa or other light material. 1/8" sheet for the body and wings will give sufficient strength and allow sanding of the wing leading and trailing edges to form the proper camber or curve to the wing's upper surface.

Tail surfaces should be as light as possible so that excessive weight will not have to be added to the nose to give proper balance. Sheet balsa 1/16" thick of fairly light grain will prove satisfactory.

Now we come to the actual construction of the glider. First cut out the outline of the wing from balsa sheet, shaping the wing tips to conform to the plan. When cutting always use a very sharp knife for one that is dull will tear the balsa and make a ragged edge. Also to prevent splitting the cutting should be made with the grain as shown in Fig. 11.

Cut out the fuselage and tail surfaces from the specified material, shaping them carefully. In the fuselage cut a slot for the weight in the front and for the stabilizer at the rear. In the upper contour you will note there is a slight recess 1/16" deep into which the wing fits when assembled.

Use light sandpaper to smooth the outline of all parts. Do not sand the edges of the fuselage until after the plane is completely assembled.

The next step is to sand the leading and trailing edges of the wing on the upper surface so it will be curved to give the wing crossection indicated on the plans. Fig. 12 illustrates how the edges are to be sanded. First use coarse sandpaper, cutting away the bulk of the wood. Then smooth the curve with a fine grade. If desired, the edges first may be whittled away with a knife, giving a bevel as shown on the wing in the figure.

When sanding a wing make the thickness less at the tips than at the center, tapering it gradually down to a thin edge at the tips from the point where the leading edge bends back.

Finally smooth the entire surface of the wing with fine paper.

Now the wing must be cut at the center so each half or pinion slants upward. This angle is called a dihedral and gives sideways stability (lateral). Cut the wing at the exact center, then bevel the edges slightly as shown in the figure directly below the planform in the drawing. Cover these edges with cement, placing a sheet of paper between them and the table, and then press them tightly together smoothing out the cement over the top of the wing. While this is done the wing tips should be raised 3/4" and held in this position until the cement is thoroughly dry. Small blocks or other suitable objects may be used to keep the tips elevated, as shown in the figure. Be sure that these blocks are parallel with the wing chord line and to each other. If they are twisted one way or the other, one half wing will have greater or less angle than the other.

To make a tight center joint spread additional cement over it top and bottom after the joint is dry. Smooth this out with the fingers, forming a skin. Then allow this to dry, with the tips still supported

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The tail planes are easy to make, no curve is necessary; merely cut them out to the correct outline and sand both upper and lower surfaces with fine sandpaper, thinning the edges. The wood thickness is specified as 1/16"; to make the surfaces light they may be sanded to 1/32" over their entire surfaces except at the center of the stabilizer and the bottom of the fin.

In addition to the fuselage two extra pieces are cut out for the bird's head, to be cemented on either side of the fuselage at the nose. The perspective assembly drawing shows how the glider is assembled. Correct outline for the parts is shown on the plan.

You are now ready to assemble your bird glider. First cover the center of the lower wing surface and the groove at the top of the body into which the wing fits, with a band of cement. Press the wing into place, centering it carefully. Then push two pins down through the center of the wing and into the body to hold the wing rigidly while the cement dries.

At the angles between the wing and the fuselage add plenty of extra cement, smoothing it out with the fingers. This helps to make a rigid joint.

Next insert the stabilizer in the rear fuselage slot, cementing it in place in similar manner. Cement the fin to the fuselage above the stabilizer, making sure it is in a vertical position at right angles to the stabilizer while drying.

One head piece for the bird now may be cemented to one side of the fuselage, holding it in place with pins. Then insert the nose weight in the groove so its front end is flush with the tip of the bill.

The second head piece cemented over this metal weight will hold it firmly in place, providing not only weight to the nose but strength to resist impacts with objects in flight.

The final assembly step is to make the launching hook from 1/32" diameter wire. Drill or punch a small hole into the lower edge of the body in the position shown. Then cover the end of the hook with cement and insert it firmly in place in the hole, with the hook forward, pressing tightly against the lower part of the body.

Cover the part contacting the body thoroughly with cement, forming a thick skin to hold it in place.

How to Decorate—The bird may be decorated with various color combinations; red and black is suggested. An effective pattern is indicated on the plans. Several types of color or paint may be used; colored dope is suggested as the best in this case for then the model will not be spotted at various points where the cement used in the assembly sticks to the surfaces.

If a clear demarcation is desired between the red and black color it is suggested you draw a thin line of red showcard color around all colored sections; this will cover points where one color may run into the other.

Another method of decoration is to cover all black surfaces with ink before the parts are assembled; the red showcard color may be added when the assembly is complete. However this will add a little weight to the model and will tend to make the tail heavier, necessitating an extra metal weight in the nose to give it proper balance.

When the color is dry your model is ready for flight. This is an exciting and important moment in any model builder's life, and care must be taken in flying your ship to prevent damage and the necessity for repairs. So look for flight instructions next month. The complete technique of flying your glider will then be given.

VICTORY

See page 63

Why COMET IS CONSERVING BALSA

. . . and how you can join in this PATRIOTIC EFFORT

PERHAPS you have noticed that Comet Kits for making solid airplane models are coming through in woods other than balsa. You may have noticed, also, that in certain Comet Flying Model Kits, some pieces are being furnished in basswood, where such substitution will not affect flying qualities.

You may have wondered why these things have been done—and we'd like to tell you. As you may know, balsa is classed as a strategic war material. It is being widely used today by the government in making life-floats, which may save the lives of thousands of our men. It is being used for special purposes in ships for the Navy and Maritime Commission.

Balsa must come a long way from the forests of Ecuador, through dangerous waters. It should be used conservatively, not wastefully. In recognition of these facts, Comet has taken the initiative and voluntarily reduced its use of balsa as described above.

For example, Comet Official Identification Models conform to the requirements of the U. S. Navy Department of Education, which specify that these models shall be made of bass, pine or similar woods—but not balsa.

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